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PROPOSED MONUMENT IN ATHENS TO COMMEMORATE GREEK INDEPENDENCE.

On the anniversary of the declaration of the independence of Greece, this year, King George announced his intention to erect a monument, to commemorate the event, in the Square of Concord, at Athens: and he charged Mr. Ziller, the architect of the Academy, to prepare a design for carrying into effect the project of a monument which his Majesty had formed. This design we now publish.

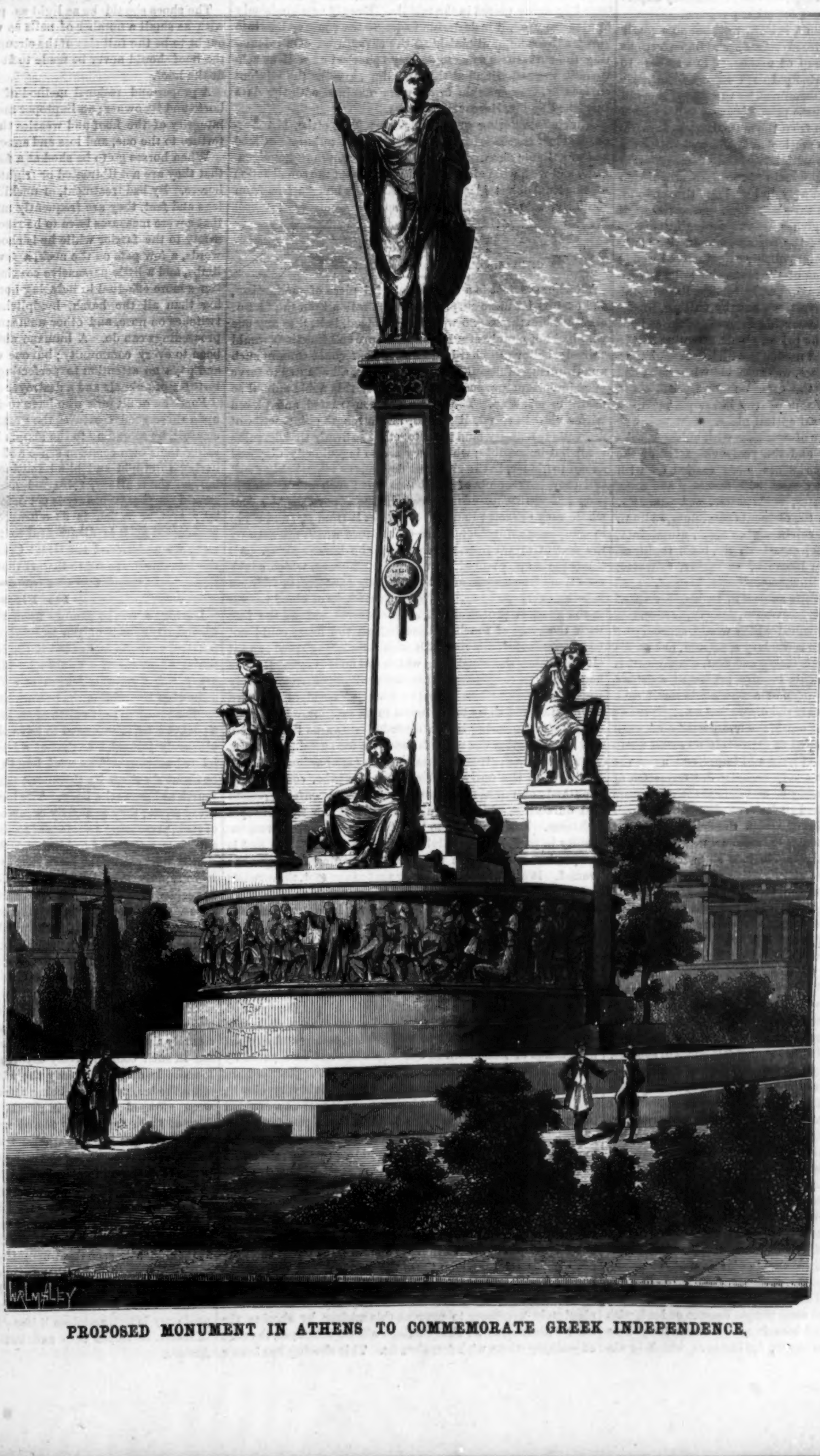
The principal figure on the summit of the monument represents Hellas. The four seated figures on the base represent the four territorial divisions of the Hellenic kingdom—Northern Greece, Peloponesus, the Archipelago, and the Ionian islands. The circular frieze round the base is composed of the most memorable scenes of the history of Greek independence. Among these representations are: Germanos, the archbishop of Patras, raising and blessing the standard of independence on the 25th of March (6th of April), 1821; the siege of Missolonghi, the battle of Navarino, the arrival of Capodistrias, and the landing of King Otho.

Two inscriptions are placed on the column: "The Nation to its Liberators," "Union gives Strength."

The monument will be of pure Pentelic marble, 60 feet high, occupying a commanding position, visible from the six principal streets of Athens, and at the termination of that which runs in a straight line from the Piræus.

The foundation stone will be laid next year, on the fiftieth anniversary of Greek independence. Invitations will be sent to the Greeks in every part of the world to attend the ceremony, which, it is hoped, will inaugurate a period of future progress as well as commemorate past glory.

The monument is to be raised by subscription, and subscriptions will be received by all the Greek consuls.



PROPOSED MONUMENT IN ATHENS TO COMMEMORATE GREEK INDEPENDENCE.

Boiler Incrustation.

Water is rendered hard by the presence of earthy salts, such as carbonate of lime and magnesia, and these are kept in solution by the aid of the free carbonic acid gas which the water contains. By boiling, the gas is expelled and the salts precipitated, when they appear as a crust on the bottom and sides of the vessel, as may be seen in any old teakettle where hard water has been habitually used. Dr. J. G. Rogers, in an important paper read at the recent meeting of the American Association for the Advancement of Science, after enumerating the various substances which, in boiler waters, contribute toward the formation of this crust, gives us some valuable practical information concerning the effect of the crusts upon the boilers, and how their formation may be prevented. Both dissolved and suspended matters are thrown down by boiling and evaporation, and slowly accumulate as a whitish, tough, porcelain like layer, which may attain an unlimited thickness. The evil effects of this formation are due to the fact that it is a poor conductor of heat. Its conducting power, compared with that of iron, is as one to thirty-seven and a half. This known, it is readily appreciated that more fuel is required to heat water through scale and iron than through iron alone. It has been demonstrated that a scale one sixteenth of an inch thick requires the extra expenditure of fifteen per cent more fuel. As the scale thickens the ratio increases: thus when it is one fourth inch thick, sixty per cent more fuel is required; at one half inch, one hundred and fifty per cent, and so on. To raise steam to a working pressure of ninety pounds, the water must be heated to 320 deg. Fah. This may be done through a one fourth shell by heating the external surface to about 325 deg. Fah. If a one half inch scale intervenes, the boiler must be heated to 700 deg. Fah., almost a low red heat. The higher the temperature at which iron is kept, the more rapidly it oxidizes; and at any temperature above 600 deg. it soon becomes granular and brittle from carbonization or conversion into the state of cast iron. Weakness of boiler thus produced predisposes to sudden explosions, and makes expensive repairs necessary. To prevent the formation of scale, the author recommends the use of tannate of soda. This is put into the boiler at regular intervals in amounts proportioned to the hardness of the water. It quickly dissolves, and, without foaming or injury to the boiler, effectively accomplishes the desired result. In the reaction which takes place, the tannic acid leaves the soda and combines with the lime of the carbonates to form tannate of lime. This is precipitated as a light, flocculent, amorphous substance, which does not subside, but eventually finds its way to the mud receiver, in the comparatively still water of which it is deposited as a mushy sediment that may be readily blown off as often as required. The sulphate of lime is decomposed by the carbonate of soda of the first reaction, soluble sulphate of soda and carbonate of lime being formed. The latter is converted into tannate of lime by fresh portions of the tannate of soda. The presence of the alkali prevents all action of the acid on the iron. Extensive trial of this method has demonstrated its utility in all kinds of boilers; and its efficacy, safety, economy, ease of application, and adaptability, will commend it for general use.—*Galaxy.*

THE LATE REV. W. V. HARCOURT'S RESEARCHES ON GLASS.

Abstract of a Paper read by Professor Stokes, British Association, 1871.

My own connection with these experiments commenced at the meeting of the Association at Cambridge in 1862, when Mr. Harcourt placed in my hands some prisms formed of the glasses which he had prepared, to enable me to determine their character as to fluorescence. I was led incidentally to observe the fixed lines of the spectra formed by them; and as I used sunlight, which he had not found it convenient to employ, I was enabled to see further into the red and violet than he had done, which was favorable to a more accurate determination of the dispersive powers. This inquiry, being in furtherance of the original object of the experiments, seemed far more important than that as to fluorescence, and the increased definiteness caused Mr. Harcourt to resume his experiments with the liveliest interest, an interest which he kept up to the last. Indeed, it was only a few days before his death that his last experiment was made. To show the extent of the inquiry I may mention that at least 166 masses of glass were found, and cut into prisms for measurement, each mass doubtless involving, in many cases, several preliminary experiments, besides disks and masses for other purposes.

It is well known how difficult it is, in working on a small scale, to make glass which is free from striæ and imperfections of the kind. Of the first group of prisms, 28 in number, 10 only showed a few of the principal dark lines of the solar spectrum; the rest had to be examined by the bright lines in artificial sources of light. These prisms seemed to have been cut at random by the optician from the mass of glass furnished to him. Theory and observation alike showed that striæ interfere comparatively little with an accurate determination of refractive indices when they lie in planes perpendicular to the edge of the prism Accordingly, in the rest of the research, the prisms were formed from the glass mass, that came out of the crucible, by cutting two planes passing through the same horizontal line a little behind the surface, and inclined 22½° right and left of the vertical, and polishing the inclosed wedge of 45°. In the central portion of the mass, the striæ have a tendency to arrange themselves in nearly vertical lines by the operation of currents of convection; and by cutting, in the manner described, the most favourable direction of the striæ is secured for a good part of the prism. This attention to the direction of cutting, combined no doubt with increased experience in the preparation of glass, was attended with such good results that now it was quite the exception for a prism not to show the principal lines. Some of the latest prisms were almost equal to prisms of good optical glass. *

On account of the difficulty of working with silicates, arising from difficult fusibility and the pasty character of the glasses, Mr. Harcourt's experiments were carried on with phosphates, combined in many cases with fluorides and some times with borates, tungstates, molybdates, and titanates. The glasses formed involved the elements potassium, sodium, lithium, barium, strontium, calcium, glucinium, aluminium, magnesium, manganese, zinc, cadmium, tin, lead, thallium, nickel, chromium, uranium, bismuth, antimony, tungsten, molybdenum, titanium, vanadium, phosphorus, fluorine, boron, and sulphur. A very interesting subject of inquiry presented itself collaterally with the original object, namely, to ascertain whether glasses could be formed which would achromatise each other so as to exhibit no secondary spectrum, or a single glass, which would form, with crown and flint, a combination achromatic in that sense. This inquiry presented considerable difficulties. The dispersion of a medium is small compared with its refraction, and if the dispersion be regarded as a small quantity of the first order, the irrationality between the two media may be regarded as depending on small quantities of the second order. If striæ and imperfections of the kind present an obstacle to a very accurate determination of dispersive power, it will readily be understood that the errors of observation thus occasioned go far to swallow up the small quantities, in the observation of which the determination of irrationality depends. Accordingly little success attended the attempt to draw satisfactory conclusions as to irrationality from the direct observation of refractive indices; but by a particular mode of compensation, in which the experimental prism was achromatised by a prism built up of a combination of slender prisms of crown and flint, I was enabled to draw trustworthy conclusions as to the character, in this respect, of these prisms, which were good enough to show a few of the principal dark lines of the solar spectrum.

Theoretically any three different kinds of glass may be made to form a combination which shall be achromatic as to secondary as well as primary spectra; but for a long time little hope of a practical solution seemed to present itself. A prism containing molybdic acid was the first to give fair hopes of success. Mr. Harcourt warmly entered into the subject, which he prosecuted with unwearied zeal. The earlier molybdic glasses prepared were, many of them, rather deeply colored, and most of them of a perishable nature. At last, after numerous experiments, molybdic glasses were obtained, nearly free from color, and permanent. Titanium had not yet been tried, and about this time a glass containing titanium was prepared. Titanic acid proved to be equal or superior to molybdic in its power of extending the blue end of the spectrum more than corresponds to the dispersive power of the glass; while in every other respect—freedom from color, permanence of the glass, greater abundance of the element—it had a decided advantage; and a great number of titanic glasses were prepared, cut into prisms, and measured. Some of these led to the suspicion that boracic acid had an opposite effect to titanic, to test which Mr. Harcourt formed some simple borates of lead, with very varying proportions of boracic acid. These fully bore out the expectation; the terborate, for instance, which in dispersive power nearly agrees with flint glass, agrees on the other hand, in the relative extension of the blue and red ends of the spectrum, with a combination of about one part (by volume) of flint glass with two of crown.

By combining a negative (or concave) lens of terborate of lead with positive lenses of crown and flint, or else a positive lens of titanic glass with negatives of crown and flint, or a positive of crown and a negative of low flint, achromatic triple combination, free from secondary dispersion, might be formed, without encountering formidable curvatures, and by substituting at the same time a borate of lead for flint glass, and a titanic glass for crown, the curvatures might be a little further reduced.

There is no advantage in using three different kinds of glass rather than two to form a fully achromatic combination, except that the latter course might require the two kinds of glass to be made to order, whereas with three we may employ, for two of them, the crown and flint of commerce. It is probable that enough titanium might be introduced into a glass to allow the glass to be properly achromatised by Chance's "light flint."

In a triple combination of lenses, the middle lens may be made to fit both the others, and be cemented. Terborate of lead, which is somewhat liable to tarnish, might thus be protected by being placed in the middle. Even if two kinds only of glass be used, it is desirable to divide the concave lens into two for the sake of diminishing the curvatures. On calculating the curvatures so as to destroy spherical as well as achromatic aberration, and at the same time, to make the adjacent surface fit, very suitable forms were obtained with the data furnished by Mr. Harcourt's glasses.

After encountering great difficulties from striæ, Mr. Harcourt at last succeeded in preparing disks of terborate of lead and of a titanic glass, of about 3 in. diameter, almost homogeneous, and with which it is intended to attempt the construction of an actual object glass, which shall give images free from secondary colour.

HORSE SHOEING.

By G. FLEMING, Royal Engineers, Chatham, England.

The horse's foot is a most wonderful piece of mechanism, and excites far more surprise and admiration than the feet of all other creatures. So wonderful, indeed, is it, that any one who had not closely studied its structure and functions would scarcely believe the hard, insensible hoof could contain such a multiplicity of beautiful arrangements, all adapted to serve most important purposes, and to render this noble animal so useful to mankind. The bones are constructed and placed with a view to speed, lightness, and strength; ligaments of marvellous tenacity bind them together so firmly that disunion is all but impossible; while they are so ingeniously disposed as not to hinder, in the slightest degree, the remarkably swift and easy movements of the bones upon each other; elastic pads and cartilages are situated in those parts of the foot where they are most required to protect it from jar, and serve to compensate for the absence of the toes which are seen on the feet of all other creatures except the horse species. All these parts are covered by a living membrane, which envelopes them like a sock, and is exquisitely sensitive, in addition to being everywhere covered by fine networks of blood vessels in the greatest profusion. This membrane endows the foot with the sense of touch, without which the horse could not be so sure-footed, nor run with such astonishing speed; and it also furnishes the blood from which the hoof is formed. The hoof itself, so rough, insensible, and to all appearance scarcely worthy of observation, reveals a world of wonders after we have exhausted those to be found in its interior. It is made of fibres, all growing in one direction—towards the ground, and that direction the most favourable for sustaining strain. These fibres are extremely fine, and they are hardest and most resisting on the outer surface; each is a tube, composed of thousands of minute cells, so arranged as to confer strength and durability, while the tubular form of the fiber ensures lightness. Each part of the hoof has its own share of responsibility in protecting the living parts it contains. The *wall* is the portion we see when the horse is standing firmly on the ground. It grows from the upper part of the foot, the *coronet*; and this growth is always going on to counterbalance the wear that is taking place at its lower border. Its outer surface is beautifully dense and smooth in the natural state; and altogether the wall is perfectly adapted to meet the wear that occurs when the horse is running at liberty in an unshod state. This is also the part on which the shoe rests, and through which the farrier drives the nails that attach it.

When the foot is lifted up backwards, we see the sole and the frog. The sole is the part that lies within the wall; it is slightly hollow in a good foot, and is thick, strong and covered with flakes of loose horn in one which has not been pared by the farrier's knife. The frog is a soft triangular piece of horn in the middle of the sole, towards the heel. It is very elastic, and serves a most important purpose, as it acts as a cushion to prevent concussion, and also hinders the horse from slipping. The sole, frog, and lower border of the wall have all to come in contact with the ground and loose stones; therefore nature has furnished them with an abundance of horn to make them strong enough to bear the horse's weight, withstand wear, and keep the delicate parts inside from injury.

So long as the horse is not compelled to work on hard roads, its hoofs are well suited to all that is required of him; but our civilization demands that we should have paved and macadamized streets, and on these the hoofs would quickly be worn away, especially if the horse had to draw or carry heavy loads; consequently lameness would ensue. It is therefore absolutely necessary to prevent this mishap by shoeing the hoof with iron, as we shoe carriage wheels with tires, the ends of walking sticks with ferrules, &c. This shoeing has been a great boon to mankind, as it has rendered the horse a hundred-fold more useful than he would otherwise be and has made him independent of the kind of road over which he has to travel.

The number of horses tortured and ruined by unreasonable paring and rasping, in addition to the heavy shoes, too small for the feet, and badly formed, is beyond computation. The frog and sole should never be pared; they flake off gradually when they have reached a certain and proper thickness; and as they have to come in contact with the inequalities of the ground, and with the loose sharp stones so frequently on its surface, is it not reasonable to urge that they should be allowed to retain their natural condition? Whoever pares, or causes to be pared, a horse's soles or frogs, is guilty of cruelty to the horse whose feet are so mutilated.

The front of the wall should never be rasped. It destroys it, and makes it thin and brittle. It ought to be allowed to retain its close, glossy, tough surface, so well adapted for resisting the weather and holding the nails. As the wall is always growing, and as the shoe prevents its being worn down to a natural length, when the old shoe is taken off, in the operation of shoeing, the lower end only of this part of the hoof should be rasped down until the excess of length has been removed; nothing more.

The shoes should be as light as possible, and fastened on with as small a number of nails as will retain them. They ought to be the full size of the circumference of the hoof, and the hoof should never be made to fit the shoe, but the shoe to fit the hoof.

A proper and rational method of shoeing is a boon to the horse and its owner; an improper method, which destroys the integrity of the hoof and wearies the limbs, is a curse and a torture to the one, and loss and annoyance to the other.

When horses go to be shod at a forge, care should be taken that they are not ill-treated or frightened, particularly young horses. By bad treatment, or unskillfulness in handling their legs and feet, they are frequently made so timid and vicious, that severe measures have to be resorted to, in order to ensure safety to the farrier while he is shoeing them. A few kind words, a few pats on the neck, a few gentle strokings of the limbs, and a little persuasive coaxing, will prove a thousand times more effectual in inducing horses to be patient in shoeing than all the harsh, loudpitched words, and knocks and twitches on nose, and other unmeaning and unhorsemanlike proceedings can do. A humane and intelligent farrier is a boon to every community; but one who is harsh, inobservant, and pays no attention to perfecting his most useful art, is a torturer of animals and a destroyer of property.

Farriers, of all men who have to do with horses, can confer upon these good creatures the greatest amount of relief and comfort, by attending to the simple indications of nature, and using their own common sense and judgment, instead of adhering to stupid and blind routine, which never improves, but, on the contrary, retrogrades. Every lover of the horse should see that its beauty is not deformed, or its utility marred by a system which is as outrageous to the meanest comprehension as it is disgraceful to the age we live in. The more we understand the Great Creator's merciful intentions, the less likely are we to thwart them.

Ice Fleas.

During a recent ramble upon the Morteratsch Glacier, I turned over some of the isolated stones which lie upon its surface, partially imbedded in the ice; under many of them I found hundreds of a minute jet black insect, which jumped many times its own length at a single spring, in a manner somewhat resembling the performance of a common flea. The ice flea is about one twelfth of an inch long. Viewed through a pocket lens, it was seen to have six legs, supporting a body obscurely jointed like that of a bee, and furnished with two jointed antennæ. The total length of the insect appeared to be about six times its thickness, the antennæ being about one fourth as long as the body. The insects were not found under every stone; they generally occurred under flattish fragments of rock, presenting a surface of about a square foot, and having a thickness of from 2 to 4 inches. Stones of this size are sufficiently warmed by the sun's rays to melt the ice beneath them more rapidly than it is liquefied by the direct solar beams. A surface of rock absorbs luminous thermal rays better than does a surface of comparatively white ice, and it transmits these rays to the ice beneath it, partly by conduction and partly by radiation from its under surface. The stone thus melts its way an inch or two deep into the ice, forming for itself a kind of basin. Sometimes these cavities are watertight, and then any space between the stone and the walls of its basin is filled with water derived from the melting ice. Under such conditions I have never found any fleas beneath the stone. But occasionally the ice basin is drained, and it was under stones resting in such comparatively dry basins that the insects were found. In all cases, nearly the whole of the fleas were found upon the ice, very few being attached to the stones. They were grouped together in shoals, so that probably forty or fifty of them frequently rested upon a single square inch of ice. On removing the stones, the insects were very lively, but this might be owing to their sudden transition from comparative darkness to direct sunlight.

I saw no indications of food of any kind beneath the stones, but we have not to search far for a possible source of food The cold of the glacier benumbs and kills thousands of insects which alight upon its surface, and bees, wasps, flies, and moths are frequently seen dead upon the ice. Then there is the so called "red snow," and other allied organisms of similar habits, which may perhaps minister to the wants of this singular insect. Is the ice flea, like its irritating cousin, a nocturnal predatory insect, and does it issue from its abode at nightfall in search of frozen bees and butterflies?—*E. Frankland, in Nature.*

PAPER MAKING IN JAPAN.

[Condensed from the Mechanics' Magazine.]

A parliamentary report on paper making in Japan, consisting of information supplied by the English Consuls in that country, which has been recently issued, is illustrated by a number of rough but very effective colored sketches, designed to elucidate the details of the various processes of manufacture described.

The extent of the paper manufacture in Japan may be estimated from the fact that, in the report before us, Consul Lowden gives a list of 260 varieties which are produced for the different exigencies of book making, letter writing, and drawing; the manufacture of umbrellas, fans, screens, mats, handkerchiefs, hats, coats, lanterns, the wicks of candles, tobacco pouches, artificial flowers, etc.; and for sundry curious special purposes, such as wrapping up incense and presents from the temples to the Government, and gifts from the Government to those whom it delights to honor.

Japanese paper is made—not from rags—but from various kinds of bark, and especially from the cuttings of the paper mulberry (*Broussonetia papyrifera*) a shrub which was introduced into the country about A. D. 610. Up to the year A.D. 280, silk with a facing of linen was used for writing upon, and thin wood shavings were also employed. In that year, however, paper was imported from Corea, and this appears to have been the only paper known to the Japanese until the year 610, when two priests were sent over to Japan by the King of Corea. The introduction of an useful art from a country which has ever been, and still is, perhaps the least known of any inhabited region on the face of the earth, is a circumstance worthy of note. One of these two missionary priests—Doncho—is said to have been a clever man, learned in the Chinese classics, and, moreover, a skillful artist. Besides the manufacture of paper, he also introduced that of writing ink and mill stones. A son of the reigning Mikado learned of Doncho how to make paper. But although the paper made by Doncho was very good of its kind, it did not take ink well; it was easily torn, and was liable to become worm eaten. We are not informed in the report before us as to the material from which this early Japanese paper was made; but it appears that the young prince, referred to, improved upon the original Corean processes by employing the cuttings of the paper mulberry, which tree he caused to be extensively cultivated throughout the country. At present, in the island of Kiusiu, the *makodzu*—as the shrub in question is called by the natives—is planted in the ninth and tenth moons (October and November); but in Kioto and its vicinity, in the first moon (February), the time varying according to the climate of the place. Each year, in the tenth moon, the plants are cut down to the roots, and from each stalk five branches appear the next year; so that in five years a large dense shrub is developed. The cuttings of the fifth year are used for making paper. The stalks, having been cut into lengths of two and a half to three feet, are steamed in a vessel which, curious to say, is made of straw, the boiler which supplies it being about 2ft. 6in. inches in diameter. This steaming process separates the outer skin or bark from the stalk, which in itself is useless except for firewood. The skins are then dried, and afterwards washed for a day in running water to facilitate the removal of the inner fiber, which is used for making the best kinds of paper; the outer dark skin being only fit for the manufacture of a very coarse and inferior material. The finer inner fiber, which after the sap has been thoroughly expressed, is called *sosori*, is then boiled, washed, strained, pounded (by beating it on a wooden table with stout cudgels), and the pulp thus obtained is made up into large balls. From these balls lumps are broken off, as required, and mixed with a kind of paste made from the root of the *tororo* plant—a shrub not unlike cotton. The mixture is stirred thoroughly till a proper consistency has been attained, which is indicated to the ear of the operator by the noise which the mixing rod makes when passing through the pulp. If not sufficiently sticky, more *tororo* paste must be added, but the exact proportion of the ingredients can only be learned by long practice. This process is performed in a wooden trough 6ft. long by 3ft. broad, called a "boat," and fitted with a perpendicular rest for leaning the straining frames against. There are two of these frames employed—an outer one and an inner one. A false bottom is fixed in the outer frame, into which a portion of pulp is then poured. The inner frame is next fitted in, so as to keep the false bottom steady, and a peculiar and dexterous jerk is given to the whole, which sets the paper. The frame is then leaned against the upright rest, to allow the water to drain off while another similar frame is being prepared. By the time the second frame is ready, the first may be removed. This manipulation can be performed very quickly by experts in the manufacture. The sheet of paper is removed from the frame with a piece of bamboo, by dexterously curling the thicker end of the paper round it; a brush is taken in the right hand and with it the paper is laid on the drying board, the side next the board being the "face" of the paper. Five sheets are placed on each side of the board, which is six feet long. In fine weather the paper dries quickly, but in wet weather artificial heat is frequently employed for the purpose. Each manipulator requires forty drying boards. The process of manufacture is then complete; and the sheets being collected, two or three straws are placed between every 20, we presume to facilitate counting them. A parcel of 100 sheets is then placed upon a table, and a heavy ruler put on the top of it, and kept steady with the right hand. The paper is held in the left, and the edges cut smooth with an knife. It is then packed in bundles ready for the market.

The paper currency of Japan is made exclusively from the bark of a tree called *mitsumata*, which is expressly reserved for the purpose, being but little used in the general manufacture. The bark of the *kaji* tree, which resembles our common willow and thrives well near water, is, however, very extensively employed for making the different peculiar kinds of paper and papier mâché, in the manufacture of which the Japanese specially excel. It is wonderful how proficient they are in imparting to paper the hardness and weight of heavy wood, and in manipulating it in all sorts of shapes. Some of the common paper is so tough as to be torn with difficulty.

The Blue Grass Region of Kentucky.

The fame of this section of Kentucky is widespread. It is esteemed a prolific region for agricultural products. Its fame is not in excess of the reality. For the raising of animals it is probably not surpassed by any region on the globe.

It is called the "Blue Grass Region," from the luxuriant growth of a particular grass (*Poa pratensis*) on which animals feed with great eagerness. The horse, the mule, the cow, the hog, and even fowl seem to relish its sweet blades. There are five counties that are, *par excellence*, the "blue grass region." It occurs in patches in other sections of Kentucky, and in other states where it has been introduced, but nowhere does it spread itself as in this region. If we recur to botanists for information regarding this grass, we shall be informed that it was indigenous to many sections, even to the White Mountains and northward, and that it was introduced from Europe. We think there is some confusion in the matter. We learn from the oldest inhabitant there, that, as now, so in all past time it has covered the rolling lands of this fertile region. It does not make good hay; its leaves are too firm. It is evergreen, not killed by the winter frosts, and when not covered by snow, is grazed upon by the animals. It forms a perfect mass of roots and *stolons* (underground stems). It grows like the Bermuda grass of more Southern States, but has not the vitality of that grass, and does not, like it, become a pest to the planter; but the thickest sward may be turned under and corn planted over it; the grass, with its numberless vital points, dies away and forms a rich mold.

Bourbon County is the principal of these five counties. There is no doubt that the geological character of this section gives character to its productions. It is most emphatically limestone. The soil has been made in great measure from the slow wearing away of the rocks. It is also exceedingly firm and contains large proportions of potash, soda and the phosphates. The waters are very impure, containing similar ingredients to the soil. It is believed that the peculiar constitution of the water gives character to the famous Bourbon whisky. We have in New York and Brooklyn many signs reading "Kentucky Bourbon Whisky." The real Bourbon is believed by many to have special medicinal properties. We do not vouch for it. There are immense stills there, where the real Bourbon was once made, which are cold now; their fires are out. The temperance movement has quenched their burning. But Bourbon county ought to be more celebrated for its animals than for its whisky.

The fair of the Bourbon County Agricultural Society was recently held in Paris, the county site of that county. The display of hogs was good in numbers and quality. They were mostly of the Berkshire breed, and some of them very large. One of the Chester breed weighed over 800 pounds, and there were others but little behind him in gravity. One sow was sold for $810, and was a noble animal. One that had twelve pigs of only a few weeks old, which, from their size and weight, have been judged as many months, was in a sad condition. The pigs had exhausted their mother, and she was an object of pity. The stock of cows was splendid. They were mostly of the Durham breed. The farmers there do not appreciate very highly the Jersey stock. They do not make beef. The variety produces butter and cheese, and these are not a speciality here. Eight thousand dollars were refused for a heifer. But when we come to horses, the half cannot be told. We question if, in any spot on this planet, such horses can be found as in this blue grass region. One seldom sees a poor horse. We doubt not that many of those that excite our admiration on the avenues of New York and in the Central and Prospect Parks, have their parentage here. The horses were exhibited for various qualities and from various ages, from the sucking colt to the fully developed animal. A most unique and interesting exhibition was announced in the following terms, "Mare with four of her colts." When the time for the exhibition arrived, the dam was ridden into the ring, the very picture of sedate motherhood, proud of her offspring, and sleek and healthful looking as great care and high feeding could make her. Then came two of her oldest, harnessed to a carriage, and noble animals they were. Then the third, with a rider, and the fourth, a one year old probably, led by the halter. When they stood ranged in order, they presented a subject for the pencil of Rosa Bonheur. There were only two entries on these conditions. We did not see the exhibition of the mules, but they may be seen daily of the most perfect character.

It is common there for gentlemen to make a speciality of some animal. One devotes his time to horses, another to mules, and another to hogs. That is the way to make sure of success in any line.

The surface of the country is undulatory, not rising into high hills, but spreading into extensive plains. We could not advise any of our enterprising young men readers to go there to buy rich farms, and abundant as are the productions. The medium price of lands is one hundred dollars per acre. We learned recently that a gentleman, wishing to sell his farm, put it up at auction, and $126 was bid per acre, and he withdrew it from sale as it was not enough; and there was nothing remarkable about the farm. To buy a farm in Bourbon county requires a fortune.—*The South.*

Another Side to the Tobacco Question.

There is much to be said for and against tobacco, and as to arrive at truth on any important question requires an examination of both sides, we herewith present views of the *Dental Office and Laboratory* which are decidedly opposed to those of the *Food Journal*, published in our issue of the 7th October. These views relate more especially to the effect of tobacco upon the teeth and mouth, and are as follows:

"If we subject this tobacco question to the *experimentum crucis* of figures, we will arrive at conclusions which will astonish us. Let us consult our arithmetic:

A habitual "chewer" will consume four ounces per week of hard tobacco. This is two hundred and eight ounces—seventeen and one half pounds per year! In twenty-five years, more than five hundred pounds—more than a hogshead will hold—of "hard stuff," mingled with sand, copperas, stems, impure molasses, olive oil, chips, and filth; the sweat from men's hands, the impurities from their bodies, saliva, and all the concentrated dirt and refuse of all kinds.

One of the speakers at the State Dental Society spoke well when he said that the destructive effects of tobacco upon the teeth were to be attributed to mechanical action, but he spoke better who said that tobacco destroyed the teeth by both mechanical and chemical action.

A word as to its mechanical attrition upon teeth. What force would be required to comminute and reduce to fineness five hundred pounds of the black mixture of sand and poisons sold under the name of chewing tobacco? Why, one steady force of many thousand pounds, continuously applied for months. The burred millstone, the most elaborately finished and finely tempered graver's tool, would wear out in the process. What, then, must be the effect of so much grinding upon the finely arranged cusps and delicate enamel of the human teeth?

It is not necessary to detail the effects of tobacco upon the general health. The habitual smoker looks as if he had just stepped out of his coffin to take a little walk, and was anxious for somebody to carry him back. Who ever knew a heavy chewer or inveterate smoker whose teeth were not cracked and split into blackened fragments, and whose breath did not remind one of—something which does not smell as sweet as perfumes from "Araby the Blest"?

Returns from Guy's and St. Bartholomew's hospitals tell us that, in all cases of cancer of the mouth, the patient had been using a pipe.

Nervousness, loss of appetite, bad dreams, vertigo, indigestion, consumption, sterility, and all the other ills which affect the nervous system, may be traced to tobacco.

A lady once said to us, when we found her husband in dressing gown and slippers, enveloped in a cloud of smoke, and surrounded with all the confusion of a disordered house, "Oh, doctor, do not disturb my husband at his smoke. I am fond of the martial cigar. The smoke covers the ugly scenes in the field of battle." Poor lady, she was willing to endure the fumes of the "fragrant Havana" for present peace; but we lived to see the bad effects of the vile habit upon the gentleman. Let the profession set their faces steadily against this vile habit. Tobacco is the twin brother of rum, and they are usually found together at last."

English Gunnery Experiments.

At a recent trial at Shoeburyness, a noteworthy incident was the penetration of the 13 inch iron target by the 10 inch gun, firing the recently improved Palliser 400 pound projectiles, with an increased charge of 70 pounds of pebble powder. This target, it will be remembered, consists of a face plate 8 inches thick backed with 6 inches of teak, behind which is a 5 inch plate, with another 6 inches of teak beyond it, and a 1½ inch iron skin plating in the rear. The penetration was very complete, and gave rise to no little astonishment, especially as the plate stood the shot remarkably well, neither crack nor fissure occurring. It is, however, to be borne in mind, says *Engineering*, that is by no means unusual to find that, of several shots fired under precisely similar conditions at the same target, some will effect penetration, whilst others will fail in so doing. Hence, although the 10 inch gun may appear to have done wonders, it may be after all that it has only done its own proper work, the penetration of the shot having been assisted by some local weakness in the plate at the point of striking.

Smoke and Dust Deflector.

It is a great comfort to be enabled to have a car window open on a hot day and not be annoyed by dust, or smoke and cinders from the locomotive. Mr. Winslow, the Superintendent of the Cape Cod Railway, has devised a very simple arrangement which secures this. Outside of this window is a movable sash, a little longer than half of the window, set at an angle of about forty-five degrees; towards the head of the train it fits tight to the window casing, and when the train is in motion, it throws the dust, smoke, and cinders away from the window, leaving the passenger in comfort, his sight not obstructed, and the car well aired. Some half a dozen of these sashes are grouped on a slight iron frame, the frame resting on the window sills, which are extended outward to give the necessary bearing. When it becomes necessary to reverse these sashes, the brakman unfastens the iron frame, which works on a pivot, and turns the whole group of sashes in the other direction at once. It takes but a very short time to reverse the sashes for the whole car. This is a very simple and inexpensive device, and the comfort which it gives the passenger is a good reason for having it applied on all passenger cars.—*Railway Times.*

Musical Dancing Toy.

The spectacle of dancing figures has always a particular charm for youthful minds; and those of riper years, who have not become wholly case-hardened by contact with the stern realities of life, can scarcely look upon the saltatory feats of the images represented in the annexed engraving without feeling a strong impulse to hearty laughter, indulgence in which would not be a bad stimulus to digestion after a hearty dinner.

Most of our readers have seen such comic images, with legs of bristle, performing their polkas and waltzes on the sound board of a piano; but that position is not well calculated to display their accomplishments to the best advantage and to the delight of a mixed assembly.

The inventors of the toy represented herewith, have therefore provided an elevated and ornamental dancing floor, on which these little masqueraders may pirouette to the amusement of many, keeping time to the music of a performer on the piano in a most exact yet amusing manner, the vibrations of the bridge of the piano being transmitted through the upright support to the circular floor upon which the images are placed.

The bottom of this support or pillar is provided with a screw clamping device, by which it is firmly attached to the base end of the sounding board bridge, which we need hardly explain, is a strip of wood upon the sounding board over which the strings pass, and upon which they are stretched tight by the pegs.

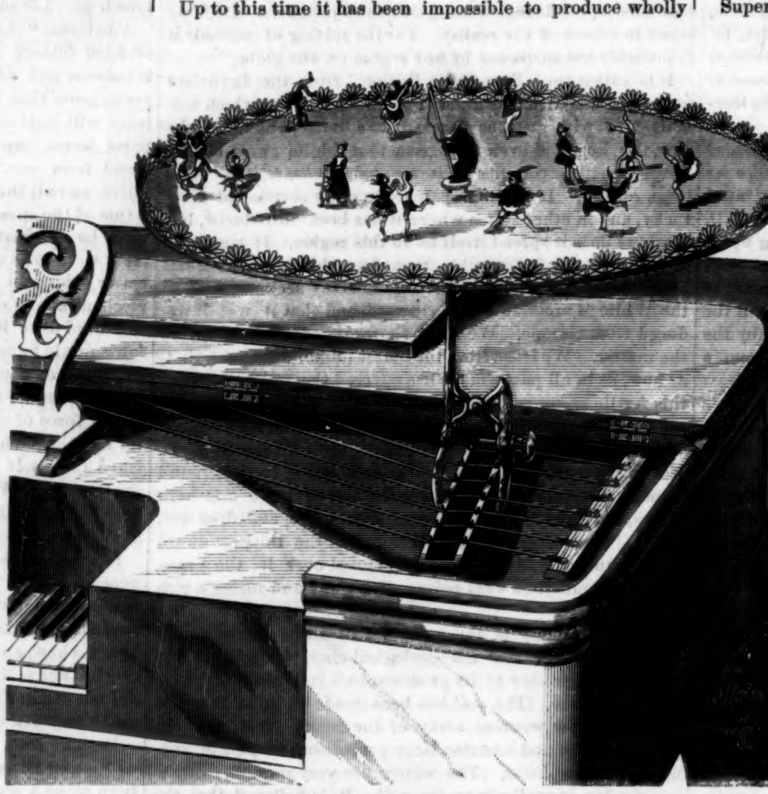
In overstrung pianos the bridge is divided into several pieces. In this case the toy is attached to any one of them. In case these pieces do not extend beyond the top of the piano, the top must either be raised or the toy attached to the main bridge.

In attaching the toy, it is not necessary that the lower end of the stand and clamp pass through between the same two strings, but either end may skip one or more strings back or front of the other, as will best adjust the clamp to the width of the bridge.

The cheaper styles have spring clamps instead of the screw clamps shown.

The vibrations transmitted through the pillar set all the images into ecstacies of motion, which imitate, in a most amusing manner, all the varieties of dancing, from the stately minuet to the hilarious vaultings of the negro minstrel "walk around."

Patented Nov. 29, 1870. Address, for further information, G. L. Wild & Bros., 420 Eleventh street, Washington, D.C.



WILD & BROTHER'S MUSICAL DANCING TOY.

Yielding's Improvement in the Manufacture of Soft Iron and Steel Castings.

The first part of this invention consists in making soft steel or iron castings by casting molten metal in hot molds capable of inclosing the metal, so as to protect it from atmospheric action, and then placing the molds in a hot oven and letting them and the contained metal cool down gradually, in such manner that the castings will be annealed when cool, and thus save the expense of reheating the castings for annealing, besides making better, softer, and more homogeneous metal; and secondly, it consists in forming the molds with a lining of decarbonizing substance to more completely decarbonize the metal, after being poured into the mold, than it can be in the conductor and remain sufficiently fluid to pour to make soft castings of the nature of wrought iron, or to make castings of steel with less carbon than can be cast in the ordinary way.

Molds of plumbago and fire clay, ground carbon, and other like substances capable of resisting great heat are used, and heated in an oven or by any other means to a white heat or thereabout before pouring the metal into them, the oven being arranged to admit of pouring the metal to be cast into the molds while in it; or the molds may be removed for filling and then replaced; they are then covered, when they are of such character as to require it, to protect the metal from the atmosphere, and the oven closed. This removes any possibility of chilling the cast metal, and subsequently the heat of the oven is gradually cooled down.

In this way the inventor claims to produce more soft and homogeneous castings than can be done when they are allowed to cool before being annealed, at less expense than when the casting heat is allowed to be lost and they have to be reheated for annealing. Another point gained is that the iron, not being chilled, does not shrink as ordinary castings do, and retains an elasticity due to the fine pores not being contracted, as they will be when subjected to chilling. This elasticity preserves the metal from cracking and breaking when subjected to blows or pressure, as it will when hard and brittle.

As a further means of softening the castings, the inventor uses in the molds decarbonizing linings, of such substances as bituminous coal treated with black oxide of manganese or chromate of iron, to remove the sulphur; or the coal and oxide of manganese may be used in combination, or the latter in combination with other substances; or linings of magnetic iron and clay, charcoal, or micaceous rock, saturated in alum and water, in the proportion of one to two per cent of alum, in combination with fire clay or fire brick or ground carbon, or any other solid, liquid, or mineral of the requisite strength. The molds having linings of this character will also be heated to receive the molten steel, first decarbonized in the refining furnace as much as it can be and remain fluid, which, being cast in them, will be wholly decarbonized and produce very fine castings of the character of wrought iron; or the decarbonizing may be stopped or regulated, to any degree required, by the time the molds are allowed to remain heated and the degree of heat they are subjected to. Thus carbon enough may be retained for high or low grades of steel, or may be removed altogether to make soft iron.

The linings will be renewed from time to time by washing or coating them with decarbonizing substances in a pasty condition.

Up to this time it has been impossible to produce wholly decarbonized castings, because the metal will not flow when decarbonized below two per cent of carbon or thereabout, but, by this improvement, the inventor claims to have accomplished this desirable result.

This method of casting is the invention of Richard Yielding, of New York city.

THE AMERICAN SAFETY STUDENT LAMP.

It is believed that the lamp, an engraving of which is annexed, affords immunity against explosion of kerosene oils, or of those mixtures of kerosene with lighter petroleum products, fraudulently sold under the name of kerosene.

Fig 1

Fig. 2

The construction of the lamp is such that the reservoir of oil is placed below and to one side of the burner, when only one burner is used, or between two burners, as shown in our engraving, its distance from the flame being so great as to insure its contents from over heating, and thus generating vapors that, mixed with the air, may become highly explosive.

At the center of the top of the reservoir is a cap which, when removed, allows the lamp to be replenished with oil. The opening has, however, a protective diaphragm of fine wire gauze, through which flame cannot pass, and which effectually prevents ignition of the fluid in the lamp when filling it. This diaphragm is shown in detail in Fig. 2. It will be seen that it is an adaptation to common lamps of the principle upon which the famous miner's safety lamp of Sir Humphrey Davy is based, namely, that flame or gas, heated to incandescence, becomes cooled below the point of ignition in passing through wire gauze.

The oil is conveyed to the burner through a wick, the tube which contains the wick being so long as to effectually prevent the heating of the thin film of oil, always present on the sides of the reservoirs of lamps, and which, by such heating, is vaporized into a highly inflammable gas.

The removal of the burner to one side of the reservoir also increases the effective light of the lamp, obviating the downwardly projecting shadow of the reservoir.

Superior cleanliness is also claimed for this lamp, which can be sold cheap enough to meet the popular want.

We need not say to the readers of this journal that anything that will lessen the number of—not to say totally prevent—the terrible accidents with kerosene, now of such frequent occurrence, will receive our warmest approval, and we doubt not this invention will prove an important safety appliance for the use of the too often unsafe oils now thrown upon the market, though we trust it will not lead people to relax their care in purchasing the best oils. There are many dangers in the storage and handling of highly inflammable and volatile liquids, which no lamp, however safe in itself, can prevent.

This lamp has been commended by the United States Lighthouse Board, and by several eminent scientists, among whom we may mention Professors Doremus and Chapman; and it is the invention of a surgeon, Dr. John F. Sanford, of Keokuk, Iowa, who was led, by his frequent experience in treating patients injured by kerosene explosions, to give attention to the subject. The invention was patented February 9, 1869. The lamps are now manufactured by Hawkins & Tunison, 48 Courtland street, New York, who may be addressed for further information.

Gunpowder.

A little sulphur, a little charcoal, and a little niter, ground together, and we have that wonderful mixture which rules for good or for evil the destinies of men. When gunpowder is ignited, the solid is almost instantly converted into gas, which, were it fired under water, and the gas cooled down to the ordinary temperature of the air, would be found to occupy about 900 times the space of the solid powder. Gases are, however, known to expand with an immense force when heated; and as the gases of gunpowder are in ordinary projectiles generated at a red heat, they are consequently greatly expanded, amounting, it is estimated, to more than 2,500 times the volume of the powder burned; and it is here we see whence springs the power of projection of firearms. Great as are the evils of wars, the use of gunpowder has shortened their duration from years to days.

Dunbar's Improved Horse Collar and Hames.

Alexander Dunbar, of Woodstock, Ontario, has invented a new construction of horse collar and hames, which consists principally in the use of a wire frame, which sustains the covering and padding, and is claimed to constitute an elastic, durable, and reliable support for all the parts of a collar, which is thus rendered lighter and cheaper. It is made of one continuous wire, bent so as to form a skeleton for the support of the padding and cover, and connect the sides of the collar beneath. At the sides of the collar, the wire is bent to form the edges, and laid over the top. At the connection beneath, however, the two thicknesses of wire are brought close together, and form a strong spring connection for the parts of the collar. Wooden plates, grooved at the edges, are fitted into the sides of the skeleton frames, and held in place by the wires entering the grooved edges. These boards extend up and down only far enough to back the padding, which is put against them and then covered by leather or other material. The padding is preferably made of an inner layer of hay or straw, covered by canvas, and an outer layer of hair, between the canvas and leather. The draft hooks are, before the covering is applied, laid over the outer faces of, or through the boards, and hooked over the wires in front. Suitable buttons, or other trace fasteners, are formed at the outer ends of these draft hooks. By hooking them over the front of the collar, a powerful leverage is obtained, as well as a full support to the boards, to which the hooks may be fastened in any suitable manner.

Crocker's Improvement in Strap Cutters.

Mr. Richard Crocker, of Marshalltown, Iowa, has patented a new way of cleaning the rotary knives of a strap cutting apparatus by passing them between the teeth of a comb as they revolve, and immediately after the cutting operation has been performed.

The mode of operation is as follows: The gage being set to the width of the sheet of leather to be cut, the leather is placed on the table and fed to the rotary cutters. The strips, when cut, have a tendency to work tight between the knives and to wind around the shaft. To remove this difficulty, the comb then comes into important use, and strips the pieces of leather from the knives as fast as they are cut.

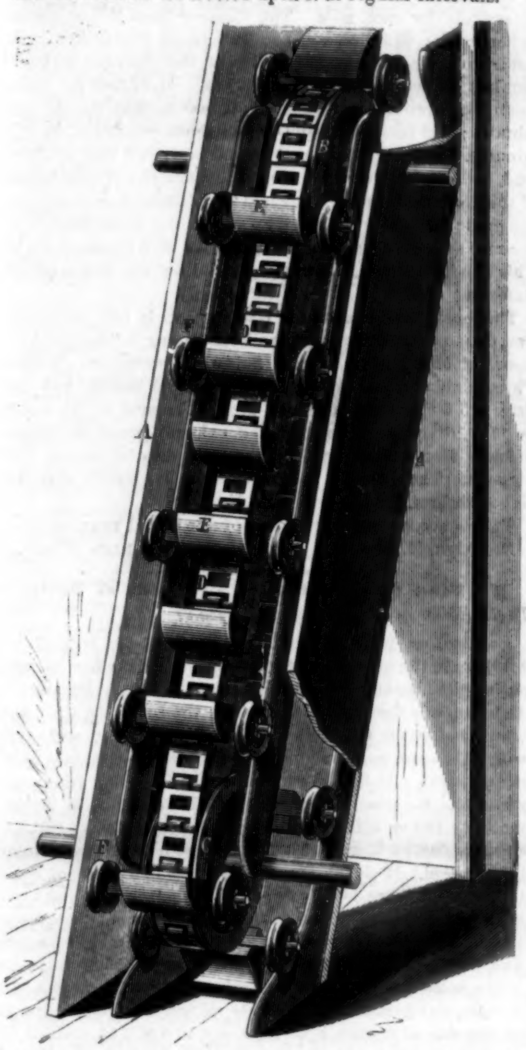
LOWE'S BUCKET ELEVATOR.

Our engraving illustrates the construction of a new bucket for sand, grain, lime, and other materials, patented August 8, 1871, by Gilbert B. Lowe, of Jamesville, N. Y., for which superior durability and ease in working are claimed.

The various parts of the invention are simple and practical in their details, and are as follows:

A is the casing, B the driving wheel, C the lower guide wheel; D is a chain belt, to which the buckets, E, are attached as shown. To the chain, at suitable intervals, are attached shafts extending laterally, and provided, as shown, with grooved rollers, F, which roll along guide ways to steady the chain belt, to lessen its friction and prevent its sagging.

The chain belt is driven by the sprocket or rag wheel, B, and is made of malleable cast iron links pivoted together, and the buckets are riveted upon it at regular intervals.



In the engraving, however, the buckets are placed in greater number at certain places than at others, to show that the roller shafts need not necessarily be as numerous as the buckets. The links are cast in such a way that they can be joined by bending a projecting piece, formed on each around a cylindrical crossbar on the one next it, and the joint is thus very quickly and easily made.

The sprocket and lower wheel are made with open work peripheries, so that, in elevating coarse material, they will not be obstructed by the lodgment of lumps between the wheels and the chain. By this arrangement, the elevator consumes less power in overcoming friction, and the rapid wear of belts in elevating sand, lime, etc., is obviated.

Address Mr. Lowe, as above, for further information.

The Best Engineering.

The following sensible remarks are culled from an able address delivered, before the Pardee Scientific Department of Lafayette College, by Ashbel Welch, C.E., at the opening of the college year, August 31, 1871:

That is the best engineering which accomplishes the purpose most economically.

The purpose may be utility, or in part ornament, or something else, of the propriety of which those only who are to pay for it should judge.

The economy must be ultimate, taking into consideration rates of interest, renewals, risks, interruptions, repairs, attendance, watching, chance of becoming obsolete, or of being disused on account of change of location, and the like.

Work is sometimes done unnecessarily expensively. For example, in some situations, railroad masonry of dressed stone, that costs twelve dollars per cubic yard is used, which, though theoretically and in itself better than masonry of rough stones that would have cost only half so much, yet is practically no better, for either would answer the purpose. The present value of the difference between the cost of renewal in one century or two centuries, is not one tenth of one per cent.

Employers have before now been ruined by splendid engineering, but it was not good engineering, for the result showed that it was too costly for its purpose. Magnificent errors sometimes gain popular applause for the moment, but not the applause of the profession, nor of employers.

The mere scientific mechanic may use a great deal of skill and science to attain certain physical results, without regard to cost or profitableness. The good engineer aims not only to attain his results by the best means, but to attain only such results as will pay.

In order to judge whether his works will pay, and what ultimate economy requires, the engineer must understand the operations to be performed on them, and the interests connected with them. A considerable amount of knowledge of collateral subjects is therefore necessary.

While everything is changing so fast, we should not build expensively for perpetuity. A thing right now may be wrong in the future. Changes in locations, in the modes of operating, in circumstances a thousand ways, may take place. For example, the locks on the Erie canal were built in the most expensive manner—to last forever. Very soon they were behind the times, and now they are the great obstacles to the improvement of that important work.

Engineers have no right to build monuments to perpetuate their own names at the expense of their employers. Instead of monuments of their skill, they become really monuments of their shortsightedness.

An engineer's capital in business, consists of his ability, arising from science, knowledge, experience, and brains, his industry, including with it health and endurance, and, not least, his character for integrity.

An engineer, to succeed, must be a laborious man. He must not only study science, but when necessary, roll up his sleeves and not be afraid of the smutch. If you don't intend to work hard, go at something else.

Men who place property and business of great value in the hands of others, will, if they are wise, select those who are known to be honest, and pay them whatever they must, to secure their services. If the circumstances are such that a dishonest man might steal many thousands a year, it is wise to give an honest man a few hundred a year more salary, by way of insurance against stealing.

The dishonest agent wastes more than he steals. To put a thousand dollars into his own pocket, he takes several thousand out of the treasury of his employer. He buys unnecessary things on which he gets a commission, or has unnecessary work done, out of which he somehow makes something. He thus throws away ten thousand dollars of his employer's money to make one thousand for himself. To allow an employé to make up the deficiencies of his salary, by helping himself, is an expensive mode of payment.

The interests put into the hands of engineers are becoming greater and greater; there is more and more to be stolen; and employers are beginning to see that it is wise to pay well for the insurance, against fraud, derived from character for integrity. I think, therefore, that such character will be hereafter of very great pecuniary value.

No system of public works, or business of any kind, can exist without the public confidence, founded on integrity of agents. An eminent English engineer once told me that a then late prime minister of a great continental government had recently expressed to him the opinion that they could not have railroads in his country, for they could not find a board of directors with whom capitalists would trust their money. Whether or not the ex-minister was right then, his statement would not be correct now, for there are both confidence and railroads in that country; but it illustrates the absolute necessity of confidence, and, therefore, of integrity.

Edgerton's Improvement in Gas Retorts.

This invention relates to a new gas retort, more particularly intended for machines in which hydrocarbon vapors are converted into illuminating gas. It consists principally in the introduction of perforated tiles within the retorts, which are in line with other tiles which support the retorts on the outside. These tiles serve to brace the retort, and prevent it from settling in case the outer tiles are broken or injured. The tiles are put in position within the retort while the same is heated and has attained its full expansion. Longitudinal or diagonal ribs or studs, framed on the top of the retort, hold a cap of luting of sand or clay, whereby the top of the retort is rendered more enduring, the bottom being protected by fire tile in suitable manner. Retorts were heretofore supported in such manner that those below supported those vertically above them. It is evident that thereby the lower retorts were exposed to an undue proportion of strain, which is taken off by the use of the external supporting tiles. This invention has been patented by Henry H. Edgerton, of Fort Wayne, Ind.

Forty Years in the Grave.

The remains of the Italian patriot, poet, and scholar, Ugo Foscolo, were lately exhumed at Chiswick churchyard, England, after forty-four years of interment. The inner shell was found to be filled with sawdust, which, having been brushed, away disclosed the body. The form was intact, and the features were still perfect. At the foot of the grave stood the doctor who attended the great Italian in his last hours, and also the hairdresser who used to shave him, and they at once simultaneously exclaimed, "That's the man!" The whiskers, peculiar in shape, which Ugo Foscolo wore in his lifetime, were still there. His skin, which was now of a pale gray color, remained unshrunken, and effectually hid all traces of the skeleton, the pores and textures being also uninjured. With the view of making a historical painting, Signor Caldesi took a photograph of the body as it lay in its coffin, and of the surrounding assemblage; the coffin was closed again, and, being bound round, was officially sealed by the Italian Minister. Dr. Piesse, who is one of the Chiswick Commissioners, attended with sanitary views; but his services were in no way required, as the body was odorless.

[For the Scientific American.]

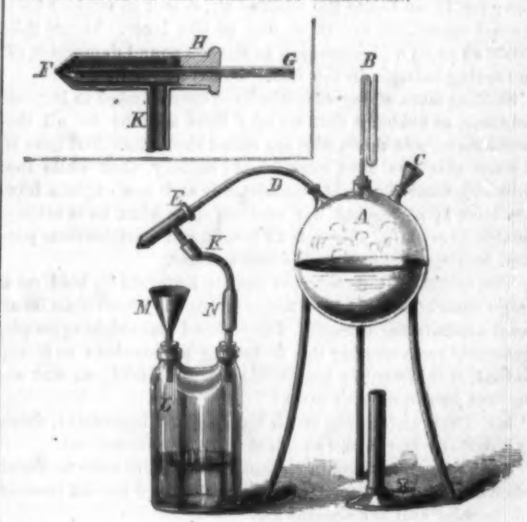
FILTRATION IN REFINERIES AND MANUFACTORIES.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY, UNIVERSITY MEDICAL COLLEGE, NEW YORK.

In the London *Philosophical Magazine*, for May, 1870, I published an account of an apparatus for rapid filtration, which might be applied in the washing of the bone black filters used in sugar refining, in hastening and perfecting the passage of the sirup through the bone black, and in gaining time in any manufacture in which a process of filtration is employed.

In principle, this apparatus is similar to that introduced by Bunsen, in that it depends upon a more or less perfect vacuum for its action. But in the manner of obtaining the vacuum it is essentially different, for in place of the almost unlimited supply of water at a considerable pressure, which the method of Bunsen demands, I have substituted an easily obtained jet of steam, and have thereby rendered the process of rapid filtration possible on the scale required in manufactories.

The direct application of the steam to the object desired, without the intervention of any pump or other complicated machine that might get out of order, or which might be injured by acid or corrosive fumes, is, I think, of sufficient importance to make a description of the apparatus interesting to the readers of the SCIENTIFIC AMERICAN.



In the above figure, A is a stout boiler, with three openings accommodating, respectively, a pressure gage, B, a supply funnel, C, closed by a stop cock, for the introduction of water, and a tube, D, connecting with the exhausting arrangement or steam vacuum tube, E, represented in section at F, in which F is a brass or glass tube one half inch in diameter, terminating in a small conical opening or nozzle one thirty-second of an inch in diameter. In the interior of F, and passing airtight through the stuffing box, H, there is a similar tube, G, about one eighth inch in diameter, and terminating in a nozzle or opening like F, and about one sixty-fourth of an inch in diameter. At K, a tube one fourth inch in diameter opens into F.

The nozzle tubes, F G, being placed in position as shown in the figure, steam is raised in the boiler A; this, passing through the tube, D E, to G, issues with violence from the nozzle, and, in passing through the nozzle of F, produces an exhaustion in the interior of the tube, F, which may be applied, as desired, by a flexible tube attached to K. The vacuum produced depends partly upon the shape of the nozzles, and partly on their relative position. The latter adjustment is obtained by slipping the tube, G, through the stuffing box, H, until the proper position is found. In the arrangement employed by me, I have without difficulty obtained, with a pressure of one atmosphere of steam in the boiler, an exhaustion capable of raising mercury eight inches perpendicularly in a tube attached to K, the exhaustion increasing steadily as the pressure of the steam increased.

At L M, a simple form of filtering apparatus is represented as attached to the steam vacuum tube, F, by the flexible india rubber connection, N.

Facts about Ropes.

"Alston's Treatise on Seamanship" gives the following facts and rules for computing the strength of ropes:

To find what size rope you require, when roven as a tackle, to lift a given weight. Divide the weight to be raised by the number of parts at the movable block, to obtain the strain on a single part; add one third of this for the increased strain brought by friction, and reeve the rope of corresponding strength.

One sixth of 40 tuns is $6\frac{2}{3}$ tuns, which, with one third added, is 9 tuns nearly, for which you should reeve a six inch or six and a half inch rope.

Conversely:—To find what weight a given rope will lift when rove as a tackle: Multiply the weight that the rope is capable of suspending by the number of parts at the movable block, and subtract one fourth of this for resistance.

Thus: 8·9 tuns, the strength of the rope, multiplied by 6, the number of parts at the movable block, minus 13·3 or one fourth, gives 40·1 tuns as the weight required.

Wire rope is more than twice the strength of hemp rope of the same circumference; splicing a rope is supposed to weaken it one eighth.

The strongest description of hemp rope is untarred, white, three stranded rope; and the next in the scale of strength is the common three strand, hawser laid rope, tarred.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Psychic Force.

To the Editor of the Scientific American:

I have been much interested in reading the articles lately published with regard to the so called new force. It has at least established for itself a claim to investigation.

Human nature is strongly inclined to believe in the marvelous and the supernatural, however insufficient the evidence may be, and even when it is entirely lacking. In combatting this tendency, scientific men are apt to lean to the opposite extreme. It must be remembered that many important facts, now incontrovertibly established, were, at their first announcement, declared, by high authority, to be ridiculous and impossible. It must also be remembered, that we know absolutely nothing with regard to the mode in which mind operates upon matter. It is easy to say that the muscle raises the arm, but who can tell us what force contracts the muscle?

In our confessed ignorance, therefore, it is rash for any one to say that mind may not, under certain circumstances, operate directly upon inanimate matter. When I grasp a fifty pound weight, and extend my arm, the will exerts an enormous mechanical force in overcoming the action of gravitation; for, if we locate the mind at all, it will be evident that it must operate at the short end of the lever. Is not this really as great a phenomenon as the six pound depression of the spring balance, in the Home-Crookes experiment?

Skillful feats of legerdemain have been alluded to in your columns, as evidence that we may thus account for all the performances of those who are called mediums. But here is a point that has been overlooked; namely, that while the prestidigitator invariably understands and can explain how his trick is performed, the medium does what he is utterly unable to explain, although an honest and conscientious person, seeking for truth on his own account.

The fact is that *pure* error cannot maintain its hold, on a large class of society, for a series of years. There must be at least a foundation of truth. I apprehend that thinking people generally are accepting the following propositions as facts; indeed, it is becoming impossible for an intelligent and observant person to deny them:

1st. That, underlying much humbug and imposition, there is a basis of fact in the so called spirit manifestations.

2d. That, under certain circumstances, there have occurred phenomena of material motion, which our known laws of philosophy will not account for.

3d. That, whatever their origin, the term supernatural cannot properly be applied to them, since they undoubtedly belong to some unexplored field of nature, and have well defined laws.

4th. That, as a means of obtaining information, either concerning this world or any other, they are unreliable and practically worthless.

Brooklyn, N. Y. HENRY C. WORK.

The Resurrection of Chicago.

To the Editor of the Scientific American:

The hearty and unprecedented response from all parts of the civilized world to the terrible catastrophe in Chicago augurs well for the sometimes doubted progress of humanity. It is confessedly a time for prompt, generous action, rather than advice, and yet a word of the latter will be ventured.

Half a century ago there were probably many places on the shore of Lake Michigan as well fitted for the site of a great city as that which Chicago lately occupied, but there is none which can now offer any comparison; for, to say nothing of the portion yet intact, her many converging railroads, her great tunnels, her breakwater, and many other proud monuments of matchless enterprise and courage, give assurance that she will rise from her ashes with a splendor and rapidity that will eclipse her marvelous beginning. Scarcely will the smoke have been cleared away from her ruins ere the spade and trowel will be heard resounding in every direction—signals of a stronger life and more superb renaissance. But just in this activity is the danger; even in the brief youth of this lacustrine giant, social science and an improved hygiene have brought to light numerous desiderata which those, who perforce must build a new city, may advantageously consider.

Only two such opportunities have occurred in modern times—at London, in September, 1666, and at Moscow, in September, 1812.

The "great fire of London," which was said to have begun in Pudding Lane and to have ended at Pie Corner, commenced on the 2d of September (Old Style), 1666, raged for several days, and destroyed upwards of 13,000 houses and eighty-nine churches, all the Inns of Court, Guildhall, the Royal Exchange, the Mayor's Palace, and the venerable minster of St. Paul—in a word, the London of two centuries back was more completely blotted out than even Chicago is now; and here we come to our point.

The celebrated Christopher Wren, being delegated to rebuild the minster and numerous other public edifices, designed and submitted to the authorities a masterly plan for an entire remodeling or reconstruction of the metropolis. In this plan broad and straight avenues were to replace the narrow tortuous streets of mediæval times.

Although straight lines and right angles pervaded the design, it is worthy of remark, just now and here, that his plan had not the monotonous and unrelieved rectangularity of which Philadelphia seems to have set the example for all American cities; but was alleviated to the eye by broad sweeping boulevards, whose intersections with the prevailing rectilinear thoroughfares were marked by noble circular esplanades. London, thus resurrected, would have been the wonder of the world; but thoughtful, large minded, and far seeing men like Wren were an exceptional and exceedingly small minority of Englishmen of the seventeenth century; for, to say nothing of the rabble, the educated men of that day were, with few exceptions, either narrow minded bigots or else frivolous libertines.

Just at that juncture, the libertines, with their very merry but exceedingly mean and unprincipled monarch, were uppermost, and they were too much occupied with their intrigues and debauches to give a thought to so trivial a matter as a rejuvenated capital; so the opportunity of a thousand years was thrown away, and the London of today stands on the narrow irregular lanes of antiquity, and daily witnesses long lines of vehicles helplessly jammed by the hour together.

A word in conclusion as to a few of the conveniences which no modern city should lack:

1. An arched subway to every street, approachable at convenient points, and of sufficient capacity to receive all the drainage, gas, water, and other pipes that will ever be needed, and which will permit the pavement bed—whatever surface roadway may be resorted to—to be laid solidly as a rock and never afterwards disturbed.

2. Edifices constructed on the associative principle, with a complete system of warming, ventilation, motive power, suppression of dust, vermin, fire, and other nuisances.

3. The innumerable chimneys which crown every wooden house with ugliness, and threaten the head of the passer-by with descending bricks, should give place to one or more stacks, of such elevation as to ensure ample draft and combustion, which stacks, simulating towers, campaniles, minarets, spires, pagodas, etc., might be an element of grandeur instead of deformity, and which, by abolishing smoke, would render the house tops available for gardens, terraces, etc.

4. Architects should be called upon to devise a substitute for the present absurd and dangerous lath and plaster finish of interiors, by which the man of the period builds one house for himself and two for the rats, and by which every dwelling is pervaded with a labyrinth of interstices, up which the first conflagration has unrestricted passage.

5. The time honored shingle of our forefathers should be abolished as an intolerable fire trap and nuisance. No city of ten thousand inhabitants should tolerate a shingle roof.

6. Party walls should have a thickness of at least twelve inches, and chimneys sixteen inches, clear of combustible material, and should of course extend above the roof.

7. Stud partitions should be grouted to at least a foot above each floor, and the latter rendered non-combustible by kyanizing or otherwise, and grouting underneath.

Such and other like precautions will prevail whenever the sentiment of the community subordinates mere personal advantage to the higher and nobler benefits of intelligent co-operation. G. H. KNIGHT.

Cincinnati, Ohio.

Incautious Advice regarding Steam Boilers.

To the Editor of the Scientific American:

In your issue of October 14th, page 244, Mr. Joseph A. Miller appears to throw ridicule upon all alleged causes of boiler explosions other than gradual overpressure. In support of his position, he relates the explosion of a kier and the bursting of some pipes in a sectional boiler. His doctrine can do no manner of good in preventing disasters, and certainly a great deal of harm in leading others to assume safety where there is none. His proof is not to the point, and not satisfactorily explained. Why do not promulgators of such dangerous notions illustrate their case by explosions not so readily forced into the narrow limits they cling to at any risk? No one asserts that explosions cannot occur from overpressure; why try to prove that which no one denies?

The kier exploded, instead of being ruptured only, because there was no local expansion, overheating, or other causes which weakened it more in one place than in another, resulting in its giving way across a large area at the same time; not, however, with the tremendous force, portrayed, it must be supposed, by misprint or a slip of the pen. (Query, what is "a horse power in a second of time," expressed in foot pounds or some other definite measurement of active force?) The kier contained not over 100 cubic feet or 6,250 pounds of water, embodying 1,525,000 units of heat, of which only 387,-500 units were available to produce the mischief. How can these produce "a 345,600 horse power in a second of time"? It is useless to state what power is stored in the water, if it cannot become active in doing mischief.

The sectional boiler did not explode, but ruptured only, because the tubes which gave way were weakened by overheating, and relieved the boiler before the balance reached a breaking strain. Mr. Miller says: "Each section was connected with the rest by two one inch pipes, giving an area of one and a half square inches, or a force of 120 pounds, with a reacting force of 60 pounds." Was not the pressure 120 pounds on both ends? We may as well keep these little matters straight, or some one in search of knowledge may receive erroneous impressions.

A Mr. Joseph A. Miller, of New York, in April, 1868, has given some very valuable results of experiments he made, proving the importance of perfect circulation, which I have taken the liberty to insert in a collection of matter headed, "What is being done to prevent Steam Boiler Explosions," to appear in Van Nostrand's *Eclectic Engineering* for November. To that I would refer Mr. Miller, Mr. Brayton, Mr. Guthrie, and others who deny the existence of physical phenomena bearing on explosions, referred to in the article.

Does Mr. Miller mean to say that sectional boilers have not exploded and cannot explode? Would not such an assertion lead to carelessness on the part of the inexperienced engineer in charge of such boilers? ROBERT CREUZBAUR.

Williamsburgh, N. Y.

Fast Railroad Time.

To the Editor of the Scientific American:

Thinking that a short account of what is being done in the United States, by men deeply interested in the motive power of our railways, and in the transportation of passengers with the utmost dispatch, and with a degree of safety approaching the maximum, I give you an account of a trip that was made over the Central Railroad of New Jersey, on Saturday, October 7th. The train, consisting of three cars, in charge of Superintendent Ricker, drawn by engine 120, run by Chief Engineer John Mulford, made the run coming from Easton, Pa., to Jersey City, 74 miles, in 89 minutes running time, an average of 50 miles per hour, or at the average rate of 1 minute and 12 seconds for each mile. The distance from White House to Somerville, 9½ miles, was run in exactly 10 minutes from a start to a dead stop. Two miles of the distance between the last named points was up a grade of 27 feet per mile. From Somerville to Plainfield, 11¼ miles, was run in 13¼ minutes; and from Plainfield to Elizabeth, 12 miles, in 12¾ minutes. This includes starting, making a full stop at Cranford, and coming to a dead stop at Elizabeth. Three miles of the distance, between Plainfield and Elizabeth, is an ascending grade of 30 feet per mile, up which the train flashed at the rate of 29½ yards between two beats of a common clock. This run is, perhaps, without a parallel on the continent of America.

The engine, an anthracite coal burner, is one of twelve first class passenger engines, built according to the specifications of Mr. Ricker, at the Baldwin Locomotive Works, Philadelphia. Her cylinders are 15 by 22 inches, and her drivers 5 feet 2 inches over the tires. The area of the steam ports is 16 square inches; of the exhaust ports, 32 square inches. Her valves have ⅞ inch outside lap, and line and line exhaust. The throw of the eccentrics is five inches, with one sixteenth lead. The engine weighs 33 tuns.

This is taken from a true copy of the actual running time.

Brooklyn, N. Y. CHARLES WARD.

To Find the Contents of Pyramids of Balls.

To the Editor of the Scientific American:

I notice, on page 269, current volume of the SCIENTIFIC AMERICAN, the query, "if there is any rapid method of computing the number of cannon balls in a triangular pyramid?" And I answer that there is. This is the rule: Multiply the number of layers with this same number plus one, and again with this same number plus two, dividing the product by 6; the quotient will be the number of balls in any triangular pyramid. Suppose, for example, you have one of 100 layers; multiply 100 by 101, and again by 102, which gives 1,030,200, this, divided by 6, gives 171,700 cannon balls in the triangular pyramid. If the pyramid is incomplete, in place of being built up till there is only one ball at the top, you must consider that the number of balls at the lower side is equal to the number of layers of the complete pyramid; take this number and calculate the complete pyramid, then calculate in the same way the portion wanting, and subtract. Suppose a triangular pyramid has 40 balls on one side below, and 25 on one side in the top layer; we say $40 \times 41 \times 42$, divided by 6, gives 11,480 for the complete pyramid, and $15 \times 16 \times 17$, divided by 6, gives 680 for the top (wanting); thus the truncated pyramid = 11,480—680, or 10,800 balls.

This rule is founded on the formula for the summation of triangular series of the second order.

$$\frac{n(n+1)(n+2)}{6}$$

I may as well add, here, the formula for pyramids with square bases; it is:

$$\frac{n(n+1)(2n+1)}{6}$$

And for rectangular pyramids, calling the number of balls at the shortest side at base (which is equal to the number of layers), n, and that of the longest side of base, m:

$$\frac{n(n+1)(3m-n+1)}{6}$$

P. H. VANDER WEYDE, M. D.

New York city.

Cast Iron Railroads.

A novel use for cast iron has been introduced in Scotland, which is the adoption of the metals for railroads and tramways, at least thus far to a limited extent. At a meeting of the trustees of the Clyde Navigation Company, of Glasgow, the engineer reported that a cast iron tramway, which had been laid down on the South Quay for trial, had stood in a most satisfactory manner the most severe tests for more than four months. During this period the passing of railway and cart traffic had been almost continuous, but the tramway showed no signs, either of displacement in line or level, or of any wear or need of repair in any way, being, to all intents and purposes, as perfect as when first laid down. Under the circumstances of the severe tests to which the tramway had been submitted, the results were considered highly satisfactory, and the further use of this style of roadway was recommended. Cast iron tramways are, therefore, to be laid upon all the quays and yards of the Navigation Company, in Glasgow, with a prospect of good results and great economy. Here is an opportunity for American inventors in the street railway line.—*Iron Age.*

THE Northern Pacific Railroad survey party, with escort numbering some 800 men, is making good progress in Montana, and has found an excellent route so far.

FAIRLIE'S IMPROVEMENTS IN LOCOMOTIVE ENGINES.

Robert Francis Fairlie, of Victoria Chambers, Westminster, England, has invented important improvements in locomotive engines, which he has just patented in the United States, through the Scientific American Patent Agency. His invention relates to a method or methods of supplying steam from the boiler of a locomotive to the cylinders which propel the wheels of swiveling or bogie frames working on eccentric pivots under the boiler, the whole forming a locomotive engine on the double bogie principle; also of a method or methods of carrying the exhaust steam to the chimney or chimneys for increasing the draft of the boiler fire or fires.

In carrying out his invention he conveys the steam, to each pair of cylinders for propelling the engine or engines, by means of a pendulous connecting pipe, which is joined at its upper end to the end of the fixed steam pipe (which usually passes through the steam space in the boiler to the smoke box tube plate), and at its lower end by universal ball and socket joint fixed direct to a steam chest between the cylinders, or to a branch pipe of which the ball and socket is the uunction of the branches, which convey the steam to one or more steam chests attached to each of the cylinders.

Provision is made for the elongation or telescopic action of the pendulous pipe, as follows; the upper end of the ball oint, at the bottom of the steam pipe, is made to form what is usually termed a stuffing box, with a gland to be screwed in and out in the ordinary manner, with this difference, that metallic packing is employed instead of the ordinary kinds. Through this stuffing box the end of the pendulum pipe, which is turned true to one diameter on its plain part, is passed leading down to within three or four inches of the ball, so that there may be an elongation or contraction of the length of this pipe to the extent already described. Thus, by the vibrating or pendulous movement of the steam pipe at its connection with the interior steam pipe, at its tube plate, by the telescopic action of its length, and by its radial action to any angle, by the ball and socket joint at the bottom, the bogie frames can oscillate or revolve, or alter their positions in relation to the boiler in any direction, and the steam pipes are perfectly free to follow all the motions, and at the same time the joints will remain perfectly steam tight.

The exhaust steam may be conveyed to the smoke box by pipes also made with ball and socket joints at their lower ends, and provided at the upper ends with a ball or spherical enlargement sliding in the lower end of the blast nozzle, which is made cylindrical to receive it.

Thus, instead of using an expansion or telescope joint in the exhaust pipe, as is done in the steam pipe, the enlarged spherical end of the pipe is made to fit the part of the fixed blast nozzle so that, the spherical end fitting the cylinder like a piston, it is still free to move up and down in it, and thus compensate for any independent vertical movement of the frame toward the boiler.

According to another method, he conveys the steam from the boiler to the cylinder of each bogie engine through its bogie pin to the steam chests of each cylinder, the pipe radiating from and swiveling around the bogie pin as the bogie itself does. He also reconveys the exhaust steam back to an outer chamber, round the bogie pin or swiveling center, and thence to the smoke box by rigid pipes fixed between the smoke box and bogie pin.

By another method he conveys the steam from the boiler to chambers fitted on the bogie pin or pivot which works in the center of each swiveling engine frame. To these chambers, which are allowed to revolve or swivel on the pivots, pipes are jointed which convey the steam to the cylinders, and which are provided with metallic or other stuffing boxes to allow for expansion or contraction caused by heat or any movement which may arise from undue play in the swiveling centers.

The exhaust steam is conveyed from the cylinders to the lower end of the bogie pivots by pipes jointed in the same manner as those described above for conveying the steam to the cylinders. The exhaust steam is then conveyed through the center of the pivots to the upper end, to which the pipes, which convey the steam to the smoke boxes or to the lower ends of the blast pipes, are connected.

From this description, engineers will gain some idea of these very radical improvements, which will attract much attention, not only from their unique character, but from the wide fame of their inventor as an engineer.

Incongruous Metal Work.

We have often, says the *American Builder*, remonstrated against the incongruous character of our metal work. Here there is a comparatively untrodden path of art. Cast and wrought iron work are extensively employed in building. These are as capable of artistic treatment as the brick or stone building with which they are incorporated. Generally however, they are either covered up, or else made in the forms of stone architectural features, as though metal were something to be ashamed of; as though it had no properties that did not suggest life and beauty in artistic design, allowing the metal to appear, and making its use, strength, and appearance forcible; marking it and emphasizing it in the building; and, instead of hiding it, or making it appear like some other material, giving it a definite design and character of its own. Thus by its force and contrast, it would very greatly add to the effect of the building where it was employed. There is no exception in the case. All kinds of purposes for which metal is used in buildings might be marked and emphasized by artistic treatment. How much less of sameness and tameness would there be if this were done, and how much greater would be the artistic force so very desirable! There is great scope here, and until more is done in this department there is some thing wanting here.

The employment of zinc for external cornices and canopies is coming into vogue. Setting aside the question of durability, why is it not possible to treat the material artistically as metal? What is the necessity of making it appear like stone? Even with a design resembling the treatment of stone, it looks far better with its glossy, natural color, as metal, than when smeared and deadened with paint not at all in accordance with its nature.

Austrian International Exhibition.

This exhibition is intended to be opened on the 1st. of May, 1873, under the especial patronage of the Emperor and his brother, the Archduke Charles Louis, and closed on the 31st of October. The Commission consists of his Imperial Highness the Archduke Rainer, president; his Highness the Lord Steward of the Imperial Household, Prince Zu Hohenlohe Schillingsfurst; his Excellency the Imperial Chancellor, Minister of the Imperial House and for Foreign Affairs, Count Von Beust; Prince Zu Liechtenstein, Prince Swartzenberg, Count Festeritz, and Count Potocki, vice presidents; and the Lord High Chamberlain, Count Folliot de Crenneville, and other high courtiers, the Ministers and heads of departments, the Presidents of both Houses of the Reichsrath, the presidents of the chief artistic, commercial, and scientific societies, and a number of gentlemen who have distinguished themselves in the various branches of science, art, and industry.

The entire arrangements have been entrusted to the Austrian Consul General at Paris, Privy Councillor Baron de Schwarz-Senborn, who has been nominated Director General of the exhibition, and who has the advantage of great experience, combined with superior abilities. Local committees are about to be formed in the various provinces of Austria and Hungary, and a special Royal Commission is to be appointed at Pesth. The objects to be exhibited will be classified into twenty-six different groups, as detailed below.

One great feature of the exhibition will be an arrangement for the productions of all countries in groups corresponding with their geographical position, and great pains will be taken to render the Oriental department in every way worthy of the almost inexhaustible resources of the Indian Empire. The position of Vienna is admirably adapted for this, having, besides the waters of the Danube, a direct communication with all the important harbors of the Levant, *viâ* Trieste. The arrangement of the Eastern department will be confided to the Austrian Consul at Constantinople, Dr. de Schwegel, who has already acquired a great reputation for his knowledge of Oriental habits and productions.

A new feature of the exhibition will be an arrangement by which the treasured collections of the various museums of London, Paris, Berlin, Moscow, Lyons, Munich, Stuttgard, etc., will appear in simultaneous position, and it is further intended to represent a history of inventions, a history of prices a history of industry, and a history of natural productions, so that the world's progress in arts, science, industry, and natural products will thus be brought into contrast.

The objects to be exhibited will be classified in the following twenty-six groups: 1. Mining and Metallurgy; 2. Agriculture and Forestry; 3. Chemical Industry; 4. Articles of Food as as Industrial Products; 5. Textile Industry and Clothing; 6. Leather and India Rubber Industry; 7. Metal Industry; 8. Wood Industry; 9. Stone, Earthenware, and Glass Industry; 10. Hardware Industry; 11. Paper Industry; 12. Graphical Arts and Industrial Drawing; 13. Machinery and Means of Transport; 14. Scientific Instruments; 15. Nautical Instruments; 16. Military Accoutrements; 17. Maritime Objects; 18. Architectural and Engineering Objects; 19. Cottage Houses; 20. Peasant Houses; 21. National Domestic Industry; 22. Representation of the Operation of Museums of Art and Industry; 23. Ecclesiastical Art; 24. Objects of Art and Industry of Former Times, exhibited by amateurs and collectors; 25. Plastic Art of the Present Time; 26. Objects of Education, Training and Mental Cultivation.

During the time the exhibition is held, international congresses are contemplated for the discussion of important questions to which either the exhibition itself may give rise or which may be specially suggested as themes suitable for international consideration. More especially it is intended to hold international congresses of learned men and artists, of gentlemen of the scholastic and medical professions, of representatives of museums of art and industry, of teachers of drawing, engineers, architects, representatives of chambers of commerce, of members of banking and insurance companies, of agricultural and forestry societies, as well as of mining and metallurgical companies. Subjects for discussion will be the following: The question of literary property; the improvement of taste; extension and development of the instruction in drawing; the perfection of all modes of transport; the question of obtaining the highest attainable profitable working of machines; cultivation of forest statics; reduction of the prices of articles of food (by increased productions, improvements of marketing affairs, reform in the kitchen, new modes of preserving, etc.); the nourishment and first training of children; the exertions made in our age in regard to therapeutics; the education of women and extension of their sphere of employment, etc.

Filters and Filtering.

Water, wine, spirit, jelly, sirup, tinctures, and a great variety of other fluids, hot and cold, often contain substances which should be separated, in order to render the fluid clear and bright. As regards water filtering, it has become pretty general; but in domestic life there are fluids, such as wine, liquid jelly, sirup, etc., which are required to be made "clear" before they are put on the table. There are three kinds of filters,—sponge for watery liquids, cotton for spirituous fluids, and wool for gelatinous fluids and oils. In every well appointed kitchen, there are tin or porcelain funnels. For filtering watery fluids it is only necessary to insert, in the choke of the funnel, a V-shaped piece of fine sponge. All such liquids, on being put into the funnel, will pass through the sponge, and become quite clear. When this effect ceases, the sponge must be removed, and well cleansed. Vinous fluids are best cleared by filtering through a cone of white blotting paper, shaped by folding a square piece of the paper from corner to corner, then folding the triangle into half its size, and opening the folds; it will fit any funnel, which will act as a support to the paper. Wines, etc., poured into this, will run through perfectly bright. In some cases where the wine is only a little thick from lees, cork, or other mechanically suspended substance, it can be made quite clear by filtering through a wad of white cotton put in the choke of the funnel; and when this answers, it is much quicker than the paper filter. For jelly and oil, wool alone is the proper medium for filtering. The felted wool jelly bag is pretty well known as the best means of clearing calves' foot jelly, and it also answers for olive and other oil. These bags are however, too expensive to be generally used; hence they are rarely seen in kitchens. A good substitute for the wool bag is a colander, on the inside of which a new flannel lining should be fitted, made of double stuff. A wad of white knitting wool, put in the choke of a funnel, will do to filter any small portion of such fluids. Many a good glass of port wine has been wasted for the want of a penny paper filter.

Iron Trade in Great Britain.

In the iron trade, says the *Ironmonger*, there is still a flush of business, notwithstanding the advance of prices, the manufacturers of the North being hard pressed for deliveries, and scarcely able to take new orders for this season. The Cleveland market is brisk, and prices higher, there are no stocks to be had, and quotations are little more than nominal. In South Staffordshire the trade is greatly interrupted by the uncertainty which prevails respecting the decision, as to prices and wages, at the preliminary meeting which will be shortly held.

The millmen are persisting in their demand for a further rise, and as this has been conceded in North Staffordshire, the probabilities are in favor of higher prices. It is said that some of the largest and more energetic firms have orders on their books which will keep them busy until the end of the year, while others are glad to accept business at a very slight advance on the old rates. Of late the variations in prices have been very marked, but as a rule absolute quotations are not given, and terms are subject to any alterations made by the association. The present uncertainty also tends to encourage speculation, especially in bars and pigs. The export demand is quieter, though orders for Canada, the United States, and the North of Europe, are by no means exhausted. The home requirements consist of merchant iron, angles, rounds, squares, tees, rods, nails, sheets, gas strips, plates, and girder iron, all of which command a brisk inquiry. Pig iron is again firmer in sympathy with the higher prices in the North, and ironstone is still increasing in value.

Surface Blow for Steam Boilers.

This is a new attachment to steam boilers, whereby the light scum on the surface of the water can be blown off.

An inverted cup is suspended, by means of a vertical pipe, from the top of the boiler, so that its lower edge will be a few inches above the water line. A suitable cock is fitted into the pipe. To blow off the surface of the water, the pipe is opened, when the steam under the cup will escape, relieving thereby the water directly beneath from pressure, and causing the same to ascend and follow the steam through the pipe. The light surface scum will thus be entirely ejected, as it flows under the cup to fill the space formerly occupied by the escaped water, and is there also drawn up by the suction. This improvement is the invention of Mr. John Gates, of Portland, Oregon.

Ruge's Lamp Extinguisher.

The careless handling and upsetting of kerosene lamps is the most common cause of accidents from explosion and consequent conflagrations. Mr. William G. Ruge, of Holstein, Mo., has patented an invention intended to prevent such explosions, the improvement being an application, to the lamp burners, of a device which will immediately extinguish the flame on the wick if the lamp is upset, shaken, or struck. To the wick tube a pair of spring jaws, which will close over the wick and extinguish the flame, unless they are held apart by a hook lug and catch, are attached for that purpose. The hook is easily disengaged by a disturbance of the lamp, and will in that case release the jaws and let them extinguish the flame.

THE ST. GOTHARD RAILWAY.—The St. Gothard Railway, with a tunnel about the length of the Mont Cenis, will, it appears, very soon be commenced. The capital necessary for the tunnel is about 60,000,000 francs, and for the lines to join the Italian and the Swiss railways, about 125,000,000 francs. Subsidies to the extent of 85,000,000 francs have been voted by Germany, Italy, and Switzerland, and the remaining 100,000,000 francs will be taken by a syndicate, 65,000,000 francs in bonds, bearing five per cent interest, and 35,000,000 francs in shares. It is estimated that at least seven to eight years will be required for the entire completion of the work.

YOKOHAMA has just seen the first locomotive ever used in Japan.

Improved Panel Raising Machine.

In describing this very simple, compact, and effective machine, we cannot do better than begin with the knives, one of which is shown, in detail, in Fig. 2 of the accompanying engraving. By referring to that figure, the reader will perceive that the cutting edge consists essentially of two distinct parts, although these are joined to form one continuous edge.

The longer portion cuts away the wood down to the common level of the depressed part of the piece upon which the panel is raised, while the shorter portion is formed into an ogee, *cyma recta*, straight bevel, or other form desired to be given to the edge of the raised panel, which is thus molded into any ornamental finish desired, or left perfectly plain.

The knife is slotted in the middle, as shown, so that, by the use of the proper set screws, it is easily and securely adjusted on the cutter head.

This construction of the knives, and the method of adjusting them on vertical arbors, distributes the work along the entire edge, instead of, as heretofore, on such machines, confining it to a narrow portion. The knives are therefore kept longer in order, and require less sharpening.

The peculiar draw cut obtained by the shape of the knives, and the method of attaching them to the cutter heads enable the machine to cut smoothly across the end of the panel; and the general arrangement of parts permits of working warped stuff with as great facility and accuracy as straight material, a feature of great importance, as will be recognised by all familiar with this branch of business.

By the use of different heads and the table adjustment, the width, from the edge of the piece to the raised panel, is regulated from nothing to four and one half inches.

Power is transmitted from the driving shaft to the tight and loose pulleys, A. The speed is multiplied by the pulley, B, and thence the power is led by belts separated by a flange on the pulley, B, to the vertical arbors, C, carrying cutter heads, D, which work on both sides of the piece at once.

The arbors run in adjustable bearings at the bottom and top. At the top they may be regulated to secure the proper thickness to fit any groove in the stiles. This adjustment is accomplished by the screw bolts, E, which move the front arbor to or from the other. The lower boxes of the arbors are held by bolts in slots on the crossbar of the frame which supports the arbors. In these slots, the mandrels may be set at any desired angle. The heads are held by screws, and are therefore adjustable on the arbors. The guide, F, is adjustable, laterally, to and from the inner arbor, and the table is adjustable vertically by the use of the hand screw, G.

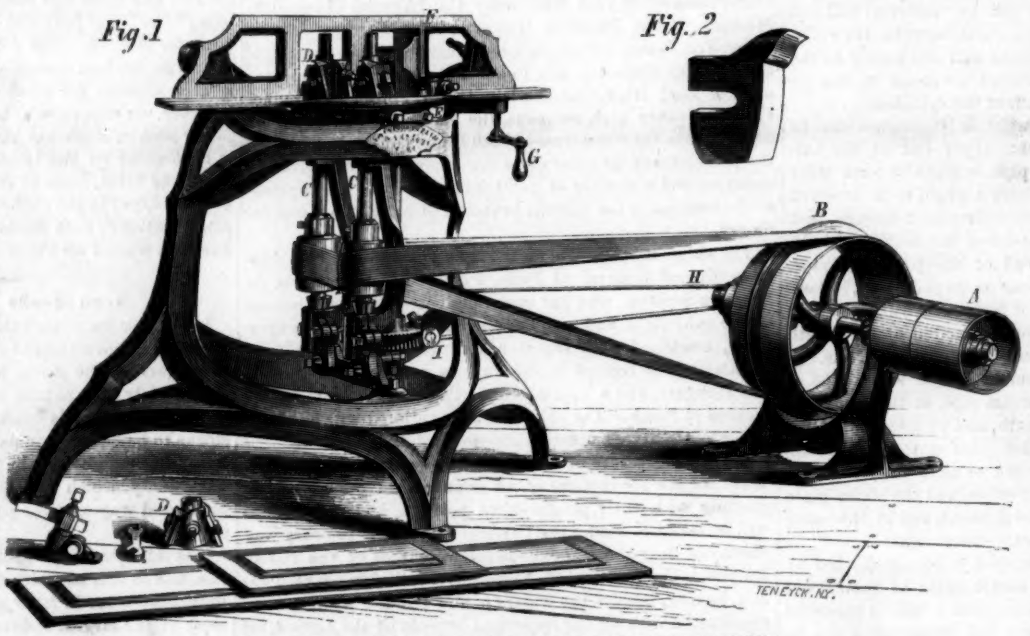
The top, including the table and guide, F, is hinged so that the whole may be turned over to the back of the machine out of the way, when it is desired to change the cutter heads, to sharpen the knives, etc.

Guards, attached to the arbor frame, extend up through the table to the tops of the cutter heads, and are adjustable up and down and to and from the work. Their office is to steadily hold the piece operated upon and prevent chattering.

The belt, H, runs on cone pulleys, and drives a counter shaft carrying the worm, I, which meshes into a worm gear on an inclined shaft having a universal joint, by which the fluted feed roller it carries at the top is made to act obliquely upon the piece, to draw it down and keep it snugly down to the table. The roller is held to its work by the action of a rubber compression spring on its movable bearing.

The raised portion on one side of the piece worked may be made as much wider than the other as desired, as is sometimes required on shutters, etc.

This machine was patented July 11, 1871, by Dwight F. Walker. For further information address Walker Brothers, corner of Second and Cataract streets, Minneapolis, Minn.



D. F. WALKER'S PANEL RAISING MACHINE.

The Rolling of Gunboats.

The British gunboats *Bustard* and *Kite* were recently subjected to experiments in order to test their rolling motion in a sea way, and discover whether it is easier with the eighteen ton gun in its position on the platform level with the fore deck, or when it is lowered into the well beneath; and, although the weather was not sufficiently rough to subject the vessels to a severe test, yet the result showed that they are much steadier when the gun is up in its position than when it is below. The *Bustard*, with her gun on deck, made only eleven rolls per minute, and the greatest roll was from 7° to port (leeward) to 4° to starboard (windward) but with the gun below she made fourteen rolls per minute, the greatest roll being from 9° to port to 13° to starboard, being three rolls per minute more with just twice the amount of heel. A similar result was obtained with the *Kite*.

Natural Rights of Inventors.

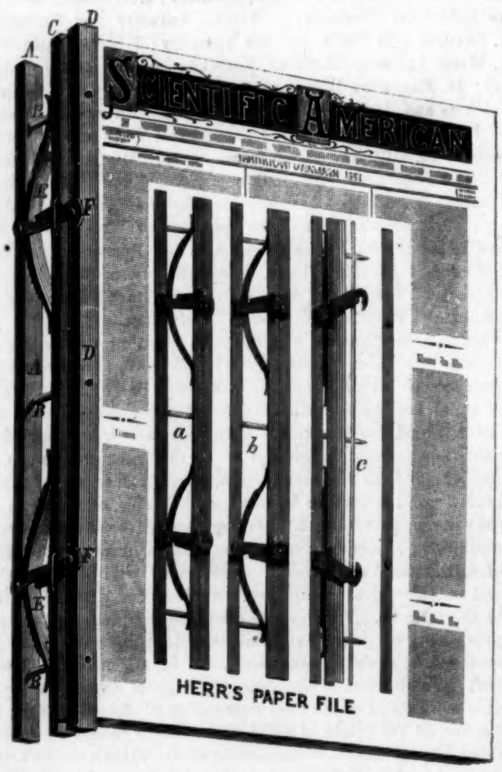
A good deal of high flown sentiment has been scattered touching the natural rights of invention, by those who, taking a high moral ground, seek to argue that it is a "sacred heritage," the violation of which is an outrage not only of equity but of religion. Besides being unpractical, this is, to say the least, ridiculous; none but those, if there be any such, who make abstract inventions unassisted by the previous labors of others, have any business to talk about a "sacred heritage," and for their own interests the less they say about it the better.

But policy and justice point decisively toward awarding to those who labor usefully in any cause the full value of their work, whatever it may be; the observance of this principle forms the very framework of society. Whether, therefore, energy and capital be devoted to the establishment of a common industry, or to the development of a special invention, it is clear that both should, if they are of service, meet with their just return, and that the latter should not sustain the indignity of a reward, but receive the fair payment due to labor.

Viewed from all points, the rights of property in invention are too strong to be shaken by the most earnest efforts of honest or dishonest antagonists, who are doing, however, real service to the cause they oppose, by encouraging free discussion on the subject, and of opening the way to the investigation of the evils and abuses which exist in the constitution and administration of the patent law.—*Engineering.*

HERR'S PAPER FILE.

A handy, durable, and tasty newspaper file is shown in accompanying engraving. It was patented through the Scientific American Patent Agency, Nov. 30, 1869, by B. F. Herr, of Livingston, Ala. It furnishes a very convenient substitute for the regular binding of newspapers, sheets of music, etc., when it is desired to preserve them with but little expense, and for the regular arrangement and preservation of papers, pamphlets, magazines, etc., in publishing houses, reading rooms, and families.



HERR'S PAPER FILE

The parts of the file are as follows: A is the back bar of the file, made of wood, as are all the bars. Pointed rods or spikes, B, are fixed firmly to the bar, A, and upon them the inside and outside compression bars, C and D, play, holes being pierced through these bars to admit the spikes. The compression is effected by elliptical springs, E, riveted in the middle to the bar, A, and exerting their expansive force between A and C. The hooks, F, prevent the outer compression bar from being forced off the spikes, and from thus releasing the papers.

The principal engraving shows a file of papers held by the file under consideration. It will be seen that the compression of the bars, C and D, not the spikes, holds the papers, so that they do not easily tear out, as would be the case without such compression.

The subordinate engravings illustrate the file empty and closed, as shown at *a*; the file with the hooks thrown back in the first movement of opening it, as at *b*, in which case the backs of the books rest against the outer angle of the guide staples, as shown; and, lastly, the file compressed and opened for the reception of papers, as at *c*, in which case notches in the backs of the hooks engage the staples, and thus hold the springs compressed till the papers are arranged, and the outer bar is replaced upon the spikes. The hooks do not release the outer bar till the springs are compressed enough to allow the staples to enter the notches as shown at *c*, in which position only can the papers be taken out of the file.

It is claimed for this file, to which the inventor has given the name of "Eclipse," that it will hold more and larger papers in proportion to its size, more securely, conveniently, and with less injury to the papers, than any file hitherto produced. It is especially adapted to papers folded like the Scientific American, *Harpers' Weekly, Hearth and Home*, and many other sixteen page papers, which, when filed, and when the leaves are cut, form, so to speak, a book. These files are made of various lengths and sizes, to adapt them to all sorts of papers, and when the bars are made long for large papers, additional springs and hooks are introduced.

Applications for the purchase of territory, or for further information, should be addressed to the Eclipse Paper File Company, Livingston, Ala.

Nickel Plating as a Preservative of Easily Corroded Metals.

A small square bar of steel coated with nickel has been repeatedly immersed in water for hours together without showing any signs of rusting, and John Spiller, F.C.S., states, in the *Photographic News*, that he finds it possible to bury it in flowers of sulphur for several days without tarnishing the luster of the nickel surface. Neither has this latter severe test any effect upon the copper and brass bars upon which the nickel coating has been applied, and these metals may even be immersed in an aqueous solution of nitrate of silver without effecting the reduction of that metal. In one of the angles only, where the coating seemed to be imperfect, was there any indication of silver reduction in the case of the brass tube, the steel bar being perfectly protected over the whole surface against the action of silver and copper solutions. Here, then, is a most valuable property in electro-deposited nickel. A metal of the zinc and iron group is proof against the action of nitrate of silver; the experiment proves it to be so, and we must regard pure nickel as belonging (from this point of view) to the class of noble metals, resisting, like gold and platinum, the attack of sulphur and of highly corrosive metallic solutions.

The nickel facing, when burnished, has a whiter color than polished steel, although not equal to silver itself, its aspect being rather that of rolled platinum. It withstands the action of heat also remarkably well, for the fusion point is very high, and oxidation occurs only at elevated temperatures. For fine balance beams and weights, lens mountings, reflectors, laboratory microscopes, Sykes' hydrometers, still worms, egg beaters, camera fittings, and a variety of apparatus used by the chemist and photographer, the nickel coating will, probably, find extensive application. Oval picture frames of very pretty effect are made of stamped brass coated with nickel. Burnished and matt surfaces of this metal may be used in combination for ornamental purposes.

Genius and Common Sense.

Genius and common sense are best together. Genius alone runs much to rashness, and common sense by itself not seldom hides behind caution. Consequently genius is frequently out at elbows, and common sense just as often remains only comfortable when it might get rich. Genius invents a thing and constructs an expensive model, and secures a patent before ever making a working drawing or fully deciding upon the proper arrangement of the parts. Common sense shivers before the expense of model, machine, and patent, and lets well enough alone, until go-aheadativeness grabs the idea, walks off with it, and leaves common sense out in the cold, neither poorer nor richer than he was before. This is a metaphorical way of stating a solid truth. There is probably not a township in the country in which two inventors might not be found, one a genius daring everything and losing all, the other priding himself on his common sense, running no risks, and making nothing.

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NEW YORK, SATURDAY, OCTOBER 28, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

FIREPROOF BUILDING.

The Chicago fire has proved that so called fireproof buildbuilding may retard the progress of a great fire, but cannot prevent its onward march, when once it has gathered sufficient power in the destruction of wooden buildings. In a city built wholly of brick, stone, and iron, no such fire would have been possible.

A single isolated block of fireproof buildings is no more secure when surrounded by wooden structures than is a so called burglar-proof safe when burglars have ample time and means to open it.

While this does not demonstrate the uselessness of making buildings in cities as nearly fireproof as possible, it shows the necessity of enforcing a better style of building than is allowed in many of the young cities on this continent.

The power of concentrated heat upon stone, bricks, and iron is little appreciated by those who rely upon these materials as security from burning. The writer was in the city of Troy at the great fire of 1862, and had an opportunity of witnessing the effect of fire upon several supposed fireproof buildings, which stood in the direct line of the advancing flames. The heat was blown upon these buildings with almost the intensity of a blast furnace. The wrought iron shutters, which were depended upon to protect the windows, curled up and warped, exposing the glass beneath, which soon broke or melted, or if supported by wooden sashes, was almost instantly dropped from the frames. Then the flames found admission to the buildings, which soon yielded.

It was noticed particularly that cast iron actually seemed to burn, and we have little doubt that in many cases there was actual burning of the metal; the same effect being produced as would be upon the bottoms of cast iron kettles placed over fire and containing hot sand. Nearly every one knows that when cast iron is raised to a red heat, it speedily oxidizes or burns. The extensive use of this material is therefore not the best practice in rendering buildings fireproof.

In the Troy fire, it was seen that even the supposed fireproof safes burned in most cases when they were not protected by masonry. At the great fire at London Bridge, which took place in the summer of 1861, the ready yielding of cast iron columns, beams, and girders was specially noticed, and formed the subject of an article in the *London Review*.

The fact is, that cast iron is no more to be depended on than wood when standing amidst a really great fire. Wrought iron does better, but it too has important defects, among which is its expansibility under heat, which, when it is used in conjunction with masonry, cracks the latter, and thus commences the work of destruction.

In short, our present systems of fireproofing need thorough revision and modification, in the light of recent experience, before they can deserve the confidence of the public.

A GIGANTIC RAILWAY PROJECT.

At present the shortest line of travel for passengers between England and India is by way of Brindisi, Alexandria and Suez, to Kurrachee or Bombay, requiring twenty days for its accomplishment. To reduce the time from England to India, to a little more than five days, is the proposition of Messrs William Low and George Thomas, who, in a communication to Mr. Gladstone, have set forth a scheme, the leading features of which are as follows:

First, to use existing lines of railway and the Mont Cenis Tunnel to Trieste, and thence to construct a railway through Austria, European and Asiatic Turkey, Persia, and Beloochistan, to Kurrachee and to Bombay.

The route proposed is as follows; From Trieste, by Fiume to the eastern shore of the Adriatic Sea, thence southwards to a point nearly opposite Brindisi; thence eastward, across Turkey, north of the Archipelago and the Sea of Marmora, to Constantinople; thence crossing the Bosphorus and turning southward at Scutari, reaching the Mediterranean at Adalia, thence skirting the coast to Alexandretta; thence southeasterly to the west end of the Persian Gulf; thence following the shore of the Gulf and of the Arabian Sea to Kurrachee, and thence to Bombay.

The distance, including the Straits of Dover, is stated to be 5,339 miles. Allowing a speed of 40 miles per hour by land, and $10\frac{1}{2}$ miles per hour by water, the time that would be required for this journey would be 5 days, 16 hours, and 46 minutes. Estimating the rate of travel by land at 30 miles per hour, the time for the journey would be 7 days, 13 hours, and 22 minutes.

There are already 1,170 miles of this line now constructed, and it is estimated that the completion of the remainder would cost about $205,000,000.

Messrs. Low and Thomas propose that the countries, through which the line would pass, shall share in the expense of construction.

Other financial features of their scheme are the formation of an Anglo-Indian Company, that shall construct and maintain the permanent way, and subordinate companies that shall construct and maintain stations, sidings, etc., for local traffic.

The projectors apprehend, very justly, we think, that the raising of the capital and the organization of companies would be the chief difficulty to be surmounted. Allowing a year's time for the preliminary business, they think the road might be completed and running within three years of the present time.

Were there not some precedent in the rapid completion of the Union Pacific Railway in this country, this scheme might be considered visionary and impracticable; but it has been demonstrated that the mere length of railways is a matter of small importance as affecting their speedy completion. The procurement of the necessary agreement on the part of the various governments, the territory of which it is proposed to traverse, is a work of greater magnitude than the building of the road itself; and, should the projectors succeed in accomplishing this, there may be some chance for the success of their project.

The rapid growth of the modern railway system is appreciated by very few, and the magnitude of some of the enterprises, now looked upon as feasible, is something that the last generation little dreamed of. Five thousand miles is a long distance, and two hundred millions of dollars quite a respectable sum of money, yet these things are talked about now-a-days without scarcely producing a sensation in the commercial world.

THE GREAT FIRES IN THE NORTHWEST.

For weeks past the papers have brought us accounts of fires raging in the woods and on the prairies of the Northwest. As such fires are almost of annual occurrence, these reports were received as somewhat sensational narratives of a series of not very extraordinary events; and, in the terrible news of the burning of Chicago, with the excitement ensuing, were almost overlooked.

Day by day, however, has the evidence accumulated that Michigan and Wisconsin are suffering to an unprecedented extent from these fires, that vast amounts of property were consumed, and many human lives destroyed, the whole disaster assuming proportions which far eclipse in extent the Chicago calamity, and which call for the most active sympathy and aid from humanity at large.

The timber which has been destroyed was alone worth more than the entire city of Chicago. It is estimated that not less than thirty thousand square miles of heavily timbered pine lands have been swept over by the flames. Thousands of farms with their stock have been destroyed, villages have been licked up by the hungry flames, and hundreds, perhaps thousands, of human lives lost.

This calamity following the great Chicago catastrophe, and the many minor accidents which have destroyed human life by wholesale, will render the present year memorable in the history of the country, as one of unprecedented disaster. Taking up our files and glancing over their contents, we shrink horror-struck from the fearful catalogue. Many of these destructive events might have been prevented by the exercise of proper care, but human watchfulness cannot control the elements.

For a long time, the region now suffering in the Northwest, has been parched with drouth, and becoming prepared for this terrible visitation. The fires must now have their own way, till natural causes extinguish them. How much farther they will ravage, or when they will terminate, cannot be predicted, although, in the ordinary course of things, the fall rains must, ere long, put an end to them. There yet remains time, however, for extended devastation, and we may expect, during the next fortnight, many additional details of the advance of the fire, the changing of fair and fruitful fields into deserts, and the flight of the houseless, homeless, and hopeless, in wild abandonment of purpose, for some indefinite shelter, perhaps to be overtaken by the pitiless flame on the desolate plains, or to find a grave in the bed of some unfordable stream.

Such has been the fate of many unfortunates, and thousands who have escaped death are now totally destitute at a time when the approaching winter renders their situation terrible indeed.

Appeals are made for contributions of everything that can be directly or indirectly useful in ameliorating the condition of the sufferers. The noble generosity that has been displayed toward Chicago, will not, we are assured, pause in its benevolent work. The appeal from the Northwest will not be made in vain. In fact, it has been already responded to in many parts of the country, and there will be no dearth of contributions as soon as the proper channels, through which to send relief, are indicated.

From the tangled mass of the reports which crowd the daily journals, it is next to impossible to form an idea of the real extent of the loss of life and damage to property, but time will undoubtedly prove this to be the most destructive fire on record.

THE NEW JERSEY ZINC COMPANY.

In our notice of the Wetherill patent trial, October 14th, an injustice was unintentionally done to the above Company, which we hasten to correct. The statement that the aforesaid patent decision was likely to result in an extensive mulcting of the Company, and otherwise to affect its prosperity, is, we are happy to say, without foundation. The operations of the Company are not dependent on the use of the Wetherill patent, or any other one patent. It is true that a large proportion of all the zinc white sold in market is made by the New Jersey Zinc Company, that their article enjoys everywhere the highest reputation, and is always in demand on account of its superior quality. But this excellence is due to the splendid nature of the Company's ores, and the scientific care with which they are treated, by processes peculiarly their own. The mining properties, controlled by the Company, which yield these ores, and upon which, in connection with its large capital, the success of the Company is based, are extensive and valuable. Each year developes more and more their intrinsic worth.

The reported decline of the Company's stock is also a fiction. The stock is not sold in open market at all, but is held, in private hands, by parties who know all about the affairs and resources of the Company, and who are not likely to be influenced to sacrifice their interests by any mere newspaper paragraph. The officers of the Company are men of ability, and have the confidence of the stockholders.

COMETS.

The approach of Encke's comet to the field of our vision will give interest to a few remarks on these remarkable and eccentric bodies. Their extraordinary appearance caused them to be regarded in ancient times with superstitious terror, and as prognostications of war and other great disasters. Their ominous aspect is hightened by their visiting our part of the heavens from all directions, and crossing the usual west to east course of the planets at all possible angles. Moreover, the train of faint light which they leave behind them is a substance so extremely thin that the smallest stars may be seen through it; and it is so slightly ponderable that the proximity of a comet of 200,000,000 miles in length seldom disturbs the equilibrium of any body near which it may happen to pass.

But that it has weight we have evidence, for the velocity of comets diminishes, a fact which also determines that the ether of illimitable space is a resisting medium, sensible to a body of such inappreciable tenuity. However, the matter in a comet is so small in weight that the comet of 1770 was involved, as it were, among Jupiter's satellites for some months, without any disturbance of either to the slightest degree. The comet of the year 1770 is an exception to this rule. In that year it was seen to be moving in the usual elliptical orbit, having a period of $5\frac{1}{2}$ years. But on calculating its time, astronomers found that it had passed very near the planet Jupiter, the attraction of which immense body had disturbed its course to a remarkable degree, and this accounted for its being unrecognized by the scientific world, its period, previous to the perturbation, having been 48 years. It returned to the sun in 1776, but was not visible to us. Again in 1779, it was so attacked by the same planet that its orbit was changed into one of 16 years, with a perihelion, or nearest to the sun, distance of 300,000,000 miles; and it has never since come to our view. The period of revolution of Encke's comet has diminished, by about 3 days, in 80 years, that is, in about 25 revolutions.

The great discovery that led to a comprehension of the nature of the orbits of comets was made by Dr. Halley, that eminent astronomer asserting that the great comet of the year 1682 was identical with those of 1607, 1531, and 1456, and foretelling its reappearance in 1759. It was retarded, however, between one and two years, and reappeared in 1835 Its next visitation will be in the year 1912, or thereabouts. History mentions appearances of this comet as far back as the year 11 B. C.

There is little reason to doubt that the earth passed through the tail of the comet of 1861. Mr. J. R. Hind, the British Astronomer Royal, predicted that the transit would take place on Sunday, June 30, of that year, and Mr. Lowe, another English astronomer, reports that, on the evening of that day, "the sky had a yellow auroral, glare-like look; and the sun, though shining, gave but feeble light. The comet was plainly visible at 7·45 P. M., during sunshine, while on subsequent evenings it was not seen till an hour later. In the parish church, the vicar had the pulpit candles lighted at 7 o'clock, which proves that a sensation of darkness was felt even while the sun was shining. The comet itself had a much more hazy appearance than at any time after that evening."

The comet of Encke, as above stated, has a period of about 3⅓ years. It passes nearest to the sun at a distance of 32,000,000 miles, about the radius of the orbit of Mercury. Its greatest distance from the center of the solar system is 387,000,000. It will reach its perihelion in January next, but will be visible through a telescope some months before that time. The appearance of a comet in our heavens is usually accompanied by a high temperature of the weather.

We look for some important discoveries, as to the nature of these mysterious bodies, by means of the spectroscope, the marvellous instrument that is destined to charm

"Her secret from the latest moon."

ELECTRICITY IN MEDICINE.

The use of electricity in medicine is not new, but the recognition of its therapeutic value, by regular physicians, is of modern date. Up to a recent period, electropathists have been considered as little better than quacks, and only confirmed invalids and credulous old women have had the courage to try the effects of a battery upon their pet complaints. This shows how a really good thing can be spoiled by its associations. As the medical schools did not recognize the agent in their instruction, it naturally came to pass that, in the hands of ignorant men, much harm was often done by its application in diseases which required very different treatment. The public were therefore pardonably shy of so destructive an agent. Another difficulty in the way of the introduction of the new practice was a want of knowledge of the proper kind of battery to be employed. The profound researches of Faraday were necessary to the invention of the apparatus now preferred by the profession, and the importance of the contribution, made by this great philosopher, is shown in the name of Faradizing, now given to the peculiar form of electricity employed in medicine. At no period in the history of this science has its possible application to therapeutics been overlooked. If we recall the familiar story of Dr. Galvani, in Bologna, dissecting frogs and exposing some of the muscles to the action of what we now know to be a weak current from a battery composed of iron and copper, we shall see that, at the very outset, animal electricity was made most prominent. Galvani was not much of a physicist, and he explained the phenomenon on the score of a latent force seated in the animal, and simply awakened by the presence of foreign metallic bodies. Animal electricity and animal magnetism soon became words of common usage.

If we had been dependent upon Galvani, we should have made little progress in our knowledge of the real cause of the twitching of the frog's legs; but fortunately for the world there lived, at the adjoining university of Pavia, a philosopher capable of at once seizing upon the true explanation. Professor Volta, the moment he heard of the experiments at Bologna, put his own interpretation upon them, and at once set to work to construct the celebrated "pile," which really lies at the foundation of the present science of Voltaism, and which, in various forms and modifications, has been the favorite apparatus used in medical practice for nearly seventy years. Volta wrote at the time, to the President of the Royal Society of England: "My colleague has made a discovery great in itself, and containing the germ of a vast number of other discoveries."

It is not necessary for us to follow the progress of investigation from the researches of Volta to the present time, as that would lead us entirely astray from the application of the results of these studies to some branch of medical practice.

One of the most striking applications of electro-magnetism was developed during the recent Franco-Germanic war, although we recollect to have seen the apparatus at the Exposition of 1867. It consists of a probe so arranged that as soon as the points touched the bullet, a circuit was completed and a little bell would be rung. It is painful enough under any circumstances to have to feel about in uncertainty in search of the missing ball, and as a bone would easily lead the surgeon astray, some tell-tale like the semaphoric apparatus described above could not be regarded in any other light than as a great blessing. In 1867, the instrument was looked upon as a toy, and contemplated by Frenchmen with a characteristic shrug of the shoulder; but in 1870, its real value was found upon many a battle field.

For purposes of interior cauterization, a platinum wire is rendered white hot by the passage of a current of electricity sufficiently powerful to be obstructed on its way from one pole to the other, and in this way parts of the body can be reached which would be inaccessible by any other form of apparatus. It is an ingenious and unexpected application of experiment originally intended to show the quantity of different forms of a battery, and has enabled physicians to accomplish some important cures.

We have seen it stated that the workmen in the quicksilver mines of Idria, who were poisoned by mercury, had all of the metal removed from their bodies by means of a battery. The patient was placed in a metallic bath of a good conducting liquid, and the metal drawn out of him on the principle of galvano-plastic deposition. It was a true case of electrolysis, but we cannot vouch for the accuracy of the story. The application of electrolysis to the treatment of disease has been made the subject of an admirable article in the *New York Medical Journal*, by Dr. A. D. Rockwell, from which we learn that this form of practice is receiving great attention from the regular medical profession, and that several learned books have been written upon the subject. It is evident from this paper that a knowledge of the electro-chemical properties of compounds will be necessary to a successful practice of electrolysis in the treatment of diseases, as the composition of the diseased tissue to be decomposed, the material of which the poles of the battery are composed, and the strength of the current employed must greatly vary the results. It may sometimes be necessary to employ an electrode composed of a metal that will readily combine with one of the constituents of the body to be destroyed. For example, if iodide of potassium be in the system, the iodine can be either set free by using a platinum pole, or it may be combined with lead by employing that metal instead of platinum; so, too, in the case of a chloride, by substituting for the positive platinum electrode an electrode of copper, the copper first oxidizes and subsequently combines with the chlorine. In both instances the physicians ought to know how far the new compounds of iodide of lead and oxychloride of copper would be likely to affect the patient. Dr. Rockwell is of the opinion that for electrolytic experiments on various substances, platinum is the best electrode, because it is not acted on; and he prefers small needles for most purposes, as they act more rapidly and effectually.

As considerable pain is caused by the introduction of the needles, it frequently becomes necessary to make use of an anæsthetic, and in this way the duration of the application can be continued until a proper result is attained. A wide range of diseases has been subjected to electrolysis and sometimes with favorable results, but the subject is new in the hands of thoroughly educated physicians, and clinical experience is the only sure basis upon which to found a well established practice. A great variety of abnormal growths—*naevi* and papillary enlargements, sebaceous, hydatid, and erectile tumors, goitres, and even cancers, are reported as having been successfully treated by electrolysis, and it is probable that this list will be largely increased by a careful study of the subject.

The celebrated Dr. Liebreich found that the hydrate of chloral was decomposed and chloroform liberated by an alkali; he reasoned that the alkali of the blood ought to accomplish the same result, and enable the anæsthetic properties to tell upon the patient. He tried the experiment, and the result was as he anticipated, and this led to the introduction of the hydrate of chloral as our best hypnotic agent. So too, with many substances of which it is idesired to make a direct application, such as, for example, iodine; by employing a solution of iodide of potassium and decomposing by electrolysis, a local application of pure iodine can be made that would otherwise be impossible. We have no doubt that numerous similar cases could be discovered, if proper investigations were to be made. The subject of the application of electricity to the treatment of disease is manifestly one that ought to attract the attention of the learned men of the medical profession.

FAIR OF THE AMERICAN INSTITUTE.

DISINFECTANTS.

There are not so many disinfectants exhibited this year as usual, the old ones being well enough known, and new ones being scarce. Bromo-chlor-alum is a long name, given to a disinfectant that has been considerably lauded of late, but about which the Chemist to the Board of Health either spoke sparingly or not at all. We have, in the history of chloralum, the repetition of the story of many a similar chemical product, which, at one time, is suggested for a particular purpose, and is then forgotten; and, in course of time, is again brought forward as an entirely new body.

About forty years ago, a Frenchman, whose name has escaped us, wrote a short work on disinfectants, which was reviewed in *Silliman's Journal;* in which book, among other things, the author recommends, as an antiseptic, the hydrated chloride of aluminum, now known as chloralum. For some reason, the matter was forgotten until Mr. Gamgee revived it; and a year ago, no household was considered safe without a moderate supply of the chloralum. The experiments with it have not quite come up to the general expectations, although in medicine it has established a favorable reputation. The prefix "bromo" would appear to indicate that some bromine was added to the solution. As bromine has many of the properties of chlorine, and is known to bleach, it is assumed that it could be advantageously employed with the chloride of aluminum. This is an assumption that would require considerable experiment before it could be accepted, and, from the report of the Sanitary Superintendents of the Board of Health, there is reason to doubt the truth of all that is claimed for it. A very little bromine would prove quite offensive, and even unendurable, besides being expensive; and we suspect the word "bromo" is used as a trade mark, and not for any merit it may impart to the article.

Carbolic acid, permanganate of potash, chloride and sulphate of zinc, chloride and sulphate of iron, and chloride of lime, are much used and approved articles, and ought to become familiarly known.

VAPOR STOVES.

These are truly chemical articles, and every chemist knows how dangerous it is to meddle with liquids that give off, at low temperatures, gases that form explosive compounds with the air. A trifling leak will spread liquid fire, over the stove and into the room, which it would be almost impossible to put out; or the gas, liberated when the heat is applied, may become mixed with air in just the right proportions to occasion the worst kind of an explosion. There does not appear to be any safety valve to this engine of destruction; and after the fearful calamity in Chicago, we should suppose the community had had enough of explosive oils, naphtha lamps, vapor stoves, and other inventions of the Evil One. What is the use of framing laws against dangerous kerosene, when the very worst products of petroleum distillation are permitted to be sold, for the use of patent stove dealers, and inventors of new lamps? The Chicago fire has taught us a lesson in this particular, and the question now presents itself with unusual force, how the sale of kerosene and naphtha can be subjected to strict control, and proper penalties be enforced for violations of the law. We doubt if vapor stoves can help the matter, and are hardly prepared to subscribe to their use.

SILVER MIRRORS.

It would delight the eyes of Baron Liebig to see the accomplishment of his favorite idea of the introduction of silver mirrors in the place of the old mercury deposits. He entered, originally from a purely charitable point of view, upon a series of investigations, to see if the dangerous and poisonous quicksilver could not be superseded by some less objectionable metal. He found in some of the small villages of Bavaria that nearly the whole population were engaged in making toy mirrors out of glass and mercury, and that the mortality and disease were positively frightful. He immediately set to work upon salts of silver, and finally succeeded in inventing a process by which a thin film of silver could be deposited at such rates as would enable manufacturers to employ it as a substitute for mercury. The original process has been considerably modified and improved, and the specimens exhibited by Mr. William A. Walker are all that could be demanded in this direction. The silver surface is so much superior to the mercury mirror, that it only needs popular information on the subject to have them universally introduced. While mercury reflects yellow rays and gives us sallow complexions, silver throws back pure white light, and enables us "to see ourselves as others see us."

SCIENTIFIC INTELLIGENCE.

A SIEGE COOK BOOK.

A French woman has published a book on the art of living in a time of siege, which contains a number of recipes not found in the usual works of this character. The Paris *Presse* copies a number of choice specimens. The ass—*l'âne*—by the tenderness of its meat, is admirably adapted for service at the most epicurean feast. Ass meat is, according to the author, "far more tender than beef, and, like mule flesh, deserves to remain in permanent use, as it bears cooking in every style." She says of the cat: "This domestic animal, the ornament and consolation of the attic, and the spoilt fondling of the parlor, is one of the most highly prized and consequently rare dishes of famine times. The meat is white, fine, and tender, only it must, before use, be kept at least forty-eight hours. It can then be served up the same as hare, as a ragout or as a roast. Horse flesh "looks and tastes exactly like beef, and not only can with difficulty be distinguished from it, but is in fact preferable to it. It is better, however, the same as cat meat, to put it in pickle for thirty-six hours." Here follows a list of horse dishes—horse *pot-au-feu*, boiled horse meat, *cheval à la Parisienne, cheval à la mode*, horse ragout, horse hash, horse steak, horse brains, etc. Dog meat, when properly prepared, resembles mutton and even deer. Dog *cotelettes* and dog *filet* are preferred. Finally, the rat is not forgotten, but, in consequence of the danger from the *trichina* worm, cannot be recommended. The object of the author was to enrich our kitchen *répertoire* by a number of dishes learned from cruel necessity; and, even if she fails in this, her book must remain a literary curiosity.

PHOTOGRAPHS AND LETTERS OF CREDIT.

In consequence of the numerous frauds committed by forged checks, some of the Vienna bankers have adopted the custom of sending, with their letter of advice, a photograph of the person in whose favor the credit has been issued, and to stop payment when the person who presents himself at the bank does not resemble the picture. If this practice were to become universal, some of our large banking houses would soon have a portrait gallery of no trifling interest, and the object of preventing fraud could be well attained.

A BONE CRUSHER FOR DOMESTIC USE.

At the last fair of the Smithfield club, Islington, the house of Hancock & Co. exhibited a new and exceedingly useful invention, namely, a machine for crushing and grinding bones by hand, so that a cook could break, crush, or grind bones to any desired size. As a quarter of a pound of bones contains as much gelatin as a pound of meat, it stands to reason that a machine that enables us to recover the whole of this, and, at the same time, reduce the bones to a condition ready for conversion into superphosphate, must prove decidedly successful. The crusher is made of steel and cast iron, and can be screwed to a block or solid table; and it costs in London one pound twelve shillings.

ACTION OF IODINE ON LIGHT.

Andrews has been studying the action of iodine on light, and finds that the beautiful purple color of the vapor of iodine is due to the fact that it permits the red and blue light of the spectrum to pass through, while it absorbs nearly all of the green rays. The transmitted rays will afterwards pass through red copper and blue cobalt glass. If the iodine vapor be sufficiently dense, all of the red rays will be absorbed, and the transmitted light will be blue. These blue rays can be afterwards passed through blue glass, but not through red. A solution of iodine in bisulphide of carbon behaves in a similar way, and appears, according to the concentration of the solution, either purple or blue, when white light is transmitted through it. The alcoholic solution, on the contrary, is red, and does not afford the same phenomena of dichroism. These experiments ought to be further extended to ascertain the relation of heat rays to iodine, and whether there is the same analogy, between the behavior of iodine and its solutions towards heat, that Andrews has observed towards light. Something practical for the use of photographers would be apt to grow out of carefully conducted

researches on this subject. Andrews has also made some curious observations on bromine. If a glass tube, half filled with liquid bromine and the other half with the vapor of bromine, be sealed and heated gently to just above the point of dissociation, the entire contents of the tube become opaque, and it looks as if it were filled with a dark red pitch. The degree at which the light rays are cut off can be observed as heat is applied. Even heated bromine is less transparent to light than cold.

COMBUSTION OF OXYGEN IN HYDROGEN.

Nearly all of our text books say that oxygen gas is a supporter of combustion, but cannot itself be burned, although chemists have been long in the habit of proving the contrary by experiment. A neat way of showing the combustion of oxygen has been devised by Himes; it consists of a glass cylinder from one to one and a half feet long (diameter not stated), open at both ends for the introduction of perforated corks. The upper cork is provided with one opening for hydrogen; the lower cork has two tubes, one for the oxygen and the other to serve as an escape tube. Hydrogen is first turned on, and ignited at the lower opening after all of the air is expelled; the cork with the oxygen tube is then inserted, the gas having been previously turned on. If the current of oxygen be sufficiently gentle, it will burn in the middle of the cylinder; while the excess of hydrogen passes off through the second tube provided for the purpose, where it can be ignited, and its burning will serve to show the march of the apparatus. In course of time, a considerable quantity of water will be produced, which will settle in the bottom of the cylinder. A little experience will enable the demonstrator to perform this instructive experiment without fear of an explosion.

MELTING POINT OF ORGANIC BODIES.

Our books contain the most contradictory statements in reference to the melting point of organic solids, such as the fats, wax, stearine, and the like; and this is due to the difficulty of instituting uniform observations. Julius Lowe has hit upon an expedient for overcoming the difficulty, by the application of a galvanic current. A bath of mercury is provided, into which plunges one pole of the battery, connecting with an alarm bell. A little ball of the substance to be tested is gathered, on the end of a platinum wire serving as the other pole, by repeated immersions in the fused mass, and it is then plunged under the surface of the mercury. An accurate thermometer is also provided. As long as the coating covers the platinum, the electric current is broken, but the moment the film melts so as to bring about a contact with the mercury, the circuit is completed and the bell begins to ring. By the use of a telescope and finely graduated thermometers, accurate determinations of the point of fusion of most organic bodies can be made in this way.

FIREPROOF SAFES—IMPROVEMENTS URGENTLY CALLED FOR.

From all the accounts that we get from Chicago, it appears that the various safe makers will not have much to brag about in respect to the safety qualities of their productions. It is stated that fully one half of the safes failed to preserve their contents during the recent fire, and that the losses are not confined to small safes, but include the larger, first class safes of the best makers. Enormous prices have heretofore been exacted for safes, and those charging most for their goods have been the most blatant in trying to convince the public that their articles were the best. But the Chicago fire has demonstrated that it is not the price charged for a safe, nor the prettiness of its paint, that imparts preservative qualities. It is evident that the present methods of safe making are sadly deficient, and that improvements are greatly needed. We call upon the inventive geniuses of our country to set their wits to work, and devise something new and really reliable in the line of fireproof safes.

IODIZED MILK.—From Hoffman's most admirable report on the "Progress of Pharmacy," we make the subjoined extract, which has a practical value for the physician: "It is well known that milk takes up iodine, disguising its taste, smell, and color, completely; since iodine is an antiseptic, iodized milk keeps for some time. Dr. Hagar calls attention to this fact, and suggests that this, perhaps, is the mildest form of administering iodine. Its therapeutic effect seems to be equal, only, to about one fifth of the iodine. Hagar thinks iodized milk will soon become a favorite form of administering iodine, and suggests the following mode of preparation: One part of iodine dissolved in ten parts of alcohol, admixed with ninety parts of fresh, warm cow's milk.

At a recent auction sale of books an elderly lady ventured timidly to offer "two and a half, just to start them." After "once, twice, gone," from the auctioneer, the lady found herself the owner of forty-two volumes of Patent Office Reports, at a cost of $105.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

INFLUENCE OF THE MOON'S AGE ON TIMBER.—N. M. T.
PSYCHIC FORCE.—C. E. S.—G. L. W.
TESTING BOILERS.—A. P. S.
ANSWERS TO CORRESPONDENTS.—A.J.T.—W.H.P.—W.W.B.
QUERIES.—B. & S.—D. H. B.—F. K.—J. G. L.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

CLEANING POLISHED BRASS.—The first requisite is to remove all grease. This may be done with a solution of concentrated lye, and fine pumice or rotten stone. A weak solution of muriatic acid and clean scouring dust will then brighten it, after which it may be oiled, with olive or cocoa nut oil. Vinegar and common salt may be used instead of the acid. The red powder, of which G. N. K. speaks, probably contains some preparation of mercury dangerous to health, and injurious to the metal. Raw mashed sour apples will also brighten brass. I know of nothing except acids to remove oxidation, unless it be powder of some mineral and friction. I consider weak vegetable acids preferable on fine work, and vegetable oils better than animal fats.—G. R. R., of Mass.

HEATING SURFACE OF BOILER.—In the SCIENTIFIC AMERICAN, of October 14, 1871, I see a query by C. and H. A , asking for a simple rule by which to ascertain the heating surface of tubular or locomotive boilers. I have an easy rule, and will give it. (As a matter of course, the diameter of the cylinders must be taken into consideration). Multiply the square of the diameter of the cylinder in inches by 5; divide the product by 2. The quotient is the area of the effective heating surface in square feet. The size of the cylinder being taken into consideration, this will give the desired result. For example, we may say a fifteen inch cylinder; as the square is 225, multiply by 5 = 1125 divided by 2 = 562½ square feet.—J. K. W., of Mich.

CLEANING POLISHED BRASS.—G. N. K., can do this by simply scouring with flour of emery and any soft oil. Polish with the emery. It is effective and cheap, and requires very little labor and time. Let him try it, and then if he thinks enough of it to continue, I will take a new hat. Tell him I wear size 7.—J. K. W., of Mich.

BACK PRESSURE IN EXHAUST PIPE.—No. 16, page 267 current volume.—Of course you have back pressure. De Pambour has proved that elbows are the worst contrivances in regard to preventing free exit to steam. If there are twelve of them, there must not only be appreciable, but considerable back pressure. You ask, how much? I suppose that you do not mean that I should blindly guess at it, but give you the means of finding out, as it will depend on the amount of steam pressure you use, the smoothness of the inside of your exhaust pipe, the capacity of your cylinders, velocity of stroke, etc. The only way to find the back pressure, with any reliable accuracy, is to have the indicator applied to your cylinder. This will give you at once the curve of your back pressure, and show exactly how much it is; being, at the same time a piece of advice in regard to whether your exhaust pipe is large enough.—V. D. W., of N. Y.

PROPORTION OF CYLINDER.—No. 20, page 267, current volume.—To find the radius of a cylinder, when the hight and number of gallons are given: Multiply the number of gallons by 231, to reduce them to cubic inches, then divide by the product of the hight with 3·1416, and extract the square root. To find the hight, when radius and number of gallons is given: Reduce the gallons to cubic inches by multiplying by 231; then multiply the square of the radius by 3·1416, and divide the number of cubic inches contained in the measure by the product. To find radius of a circle from the area: Take the area in square inches, and divide by 3·1416, and extract the square root of the quotient. Having the radius in inches, it is of course easy to find the diameter in feet and inches.—V. D. W., of N. Y.

LOCUST TIMBER FOR POSTS.—On page 170, current volume of the SCIENTIFIC AMERICAN, V. A. J. asks for information concerning white locust seed. I will give what I can. First: It is the yellow locust, and not the white, that he should get for post timber. The white will last but little longer than chestnut. I have yellow locust posts standing now that have been in the ground over sixty years. Second: To sprout the seed, I think it should be scalded with water at the boiling point or nearly so. I have observed, where a heap of locust brush was burned, the seeds sprout and shoot up quite thickly soon after, owing perhaps to some of the seeds being roasted just sufficient to burst the shell. Sometimes a hard freezing winter, without much snow, will cause them to germinate. I will try some by scalding and otherwise, and report, either through this column, or by mail, if V. A. J. will send his address to box 78, Lewisburg Pa.—J. A. G.

INFLUENCE OF FRICTION ON STEEL.—In answer to query 12, by J. H. N., October 7, I will say I do not think knitting needles loose their temper during use, but continued use will destroy the texture or crystalline structure of the steel, and retempering cannot restore it. I have observed that knitting needles, remaining in the pot, and that have been drawn six or eight times, have as perfect a spring temper as those but once drawn.—C. P. S. W., of N. H.

CLEANING POLISHED BRASS.—Take eight parts water, and one part muriatic acid; mix them, and put in common water lime, until the mixture is a little thicker than water. Shake up well before using. Pour some on a rag, and put on the brass. Let it stay a minute or two and then rub. It will clean the dirtiest brass more quickly and better than anything else.—H. P. M., of Conn.

SCALE ON BOILERS.—D. T. T.—The scale, of which you send a specimen, is doubtless formed very gradually, and drops off when broken by the expansion and contraction of the boiler. The feed water heater, about which you inquire, is a good one, and will prevent the formation of such scale as you describe.

FIXING PENCIL DRAWINGS ON PAPER.—C. V. B. will find an effective method on page 394, volume XXIV., of the SCIENTIFIC AMERICAN.

HYDRAULIC AND STEAM PRESSURE.—G. R. P. is informed that water, air and steam pressures are all equal in their effects upon boilers, provided that the pressure be steady, and entirely free from jarring motion. In testing boilers hydraulically, the pumps frequently give sudden jerks at each stroke, and this strains boilers to a great extent, weakening them much in a manner that escapes the eye of the person making the test.

BLASTING SUBMARINE ASPHALT ROCK.—C. M. is informed that asphalt rock under water can be easily blasted with dualin, dynamite, or nitro-glycerin. Full explanations of the manner of using the various explosives have been already given in the SCIENTIFIC AMERICAN.

THE "AMERICAN BUILDER."—H. C. C. is informed that this journal was recently published in Chicago, but the office has been destroyed in the great fire. We trust the publishers will be able to resume its publication before long.

SPEED OF LATHES AND PLANERS.—Z. Y. O. had better consult Byrne's "Practical Metal Worker's Assistant," for full information in answer to his two questions.

ACCUMULATION OF AIR IN WATER PIPE.—If J. P. will forward his diagram, we will examine it; and, if deemed of general interest will engrave and publish it.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—RAISING WATER.—We have a spring 145 feet from the house, fall, 30 feet. Can we bring the water to the house with a suction pump? And will a cucumber wood pipe, 1½ inch bore (such as is used on cucumber pumps,) answer as a pipe? If not, what will be the best and cheapest pipe? The soil is red shale, and the water is used for drinking.—M. H. P.

2.—FRICTION MATCHES.—What ingredients or articles are used in the manufacture of friction matches? How are they generally used, and what should be the proportional parts of the same?—H. C.

3.—DIMENSIONS OF RIGHT ANGLED TRIANGLE.—I want a rule for finding the perpendicular of a right angled triangle, when the base and the difference between the perpendicular and the hypothenuse only are given. An arithmetical rule is requested.—C. C. B.

4.—VIGNETTING MEDIUM FOR PHOTOGRAPHERS.—Is there any substance, that can be cheaply prepared and may be cut with a knife, which, when of the thickness of one sixteenth to one fourth inch, is nearly or entirely opaque, and becomes transparent upon being shaved down, the transparency being regulated according to the extent of the reduction of thickness, so that it becomes nearly or quite transparent when reduced to the least possible thickness? Such a substance would be of great value to photographers for making vignettings, instead of using glass or tin ones.—T. J. A.

5.—DRAFT IN SAWING.—Can any of the experienced give a proper rule to determine the amount of draft in sawing different kinds of lumber?—E. D. B.

6.—OIL RESISTING METAL.—Is there any metal (or is there any way of doctoring any metal) that has no attraction for oily substances, especially for butter, that is, to which butter will not, and cannot be made to, stick?—W. R. S.

7.—AIR PUMP.—I would like to know how to make an air pump to force air into a cylinder, with a pressure of twenty-five or thirty pounds to the square inch, capable of supplying enough for a one eighth or one sixteenth inch pipe or vent.—N. S.

8.—DRYING ROOM FOR CLOTHES.—Would some of your readers give a description of a drying room for clothes? We have one of these rooms, heated by steam pipes, in our school, but owing to the want of a sufficient draft the moist heat is not drawn out strongly enough, and of course condenses again, which causes the drying process to be very slow, taking more than half a day; while, from what I hear of other drying rooms, half an hour ought to be sufficient. I have consulted some books referring to the subject, but the execution of their designs would involve great labor and expense.—J. J.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

COMPOSITION BOXES.—Thomas Brian Gunning, New York city.—This invention consists in an improved mode of constructing boxes so that the covers will tightly and automatically clasp the bodies thereof and form a joint. The body of the box may be of any desired form, but is preferably made circular. The essential requirements of the invention are—first, that the box shall be made of rubber or other elastic material; second, that the outer face of the body and the inner side of the rim of the cover shall be correspondingly beveled. The advantage of constructing a box of elastic material with bevel edged corner and body is, that it forms a clasp joint, that will hold firmly, and yet can be easily separated.

SHIELD FOR BOOTS AND SHOES.—Orrin Collier, of Sacramento, Cal., assignor to Robert M. Funkhouser, of New York city.—This invention relates to a new and useful device for protecting the bottoms of pantaloons from water and mud; and consists in a detachable shield on the heel of the boot or shoe, made of metal or other suitable material, projecting back and from the heel.

WASHING MACHINE.—Loyal M. Doddridge, of Union City, Ind.—An oblong rectangular box, having vertical ribs centrally placed opposite to each other, has, on the inner parts of the long sides, friction rollers, arranged in an upright position near the short sides. Projecting fingers are placed upon a vertical shaft. This shaft is made with a conical shank, which is fast in a hollow socket that serves as its journal. The journal projects up and beyond its bearing, and receives a fast spur wheel upon it. A circular rack is arranged on a vibrating shaft in a frame, and may oscillate the shaft, or it may be rotated by any suitable mechanism. The clothes being placed at either end of the oblong box, and the parts caused to oscillate or rotate, the fingers will seize upon the clothes and carry them over the ribs from one side to the other, pressing and rubbing them thoroughly.

COTTON TIE STRETCHERS.—Samuel Mather, of New Braunfels, Texas.—This is a simple, convenient, and effective instrument for drawing the band around the bale, so that it may be drawn snug and conveniently fastened. It consists of a hand lever, with gripping device, to which a bent link, also with a gripping device, is pivoted, the apparatus being adjustable for different lengths of bands, and very convenient in use.

HAMES FOR HARNESS.—Peter B. Watson, of Belvidere, N. J., assignor to himself and Moses A. Dewitt, of same place.—This invention has for its object to furnish improved harness hames, which shall be so constructed that the hame tug hook may be adjusted to shift the draft pressure upon the horse's shoulders as may be required, and which shall at the same time be simple in construction and easily adjusted. It consists in the construction and combination of various parts, designed to effect the purpose set forth.

CHAIR.—William W. Haupt, Mountain City, Texas.—This invention relates to that class of chairs in which the back, seat, foot rest, and head rest, are all self adjusting, and operated by the natural movements of the occupant, who is enabled to occupy a position erect, horizontal, or at any desired inclination between the two. In this case, there is an improved arrangement of parts, tending to render the chair more easy of operation, and more comfortable for the occupant. The chair is provided with rockers, so that an oscillatory movement may be given to it, whether the position of the occupant be a reclining or sitting one.

CHURN.—Marion G. Decrow, M. D., Newark, Ohio.—This invention relates principally to the rod which connects the dasher with the lever that operates it, said rod being bent to one side, so that butter can be taken out of the churn without removing the rod.

SHADE RACK.—Harvey Lull, of Hoboken, N. J.—This is an improved rack for holding the pulley that receives, holds, and stretches the cord by which the shade is rolled and unrolled. It is simple and inexpensive in construction and effective in operation. The body of the rack is made of sheet metal cut into the proper shape and struck up into the desired form. The side edges of the plate are brought nearly together and are then bent outward, only sufficient space being left between them to receive the dog to which the knob spindle is attached. The extreme edges of the plate are turned outward, and have teeth formed in them, upon which the dog takes hold. The upper end of the dog is bent inward at the same angle as the inclination of the rack teeth. The lower part of the dog is bent inward and up ward, to serve as a spring to hold the dog down upon the teeth of the body. The upper end of the dog is bent inward and downward, to receive and hold the end of the spring. The dog is notched at its upper and lower ends, to receive the turned out toothed edges of the body, while the side edges of the dog and spring overlap the side edges of the body. A knob, the spindle of which passes through the pulley that receives the cord, is secured to the dog.

VAPOR BURNER.—Isaac Whitehouse, of New York city, assignor to Charles Royle, of same place.—This invention has for its object to furnish a simple and effective burner for burning the gas generated from gasoline and other suitable light hydrocarbons, and which will give a strong and uniform flame. The piece which is screwed upon the end of the gas pipe, has, at the opposite end, a screw, upon the outer end of which is cast a thumb piece, and which passes into and through a chamber formed in the center of the piece. The point or forward end of the thumb screw is made conical to fit into a conical cavity formed at the enlarged inner end of the small passage that leads from the chamber into the cavity that receives the end of the gas pipe, so that the screw may serve as a valve to regulate and stop the escape of the gas, as required. A passage leads from the chamber into the burner tube. The end of the upper arm, or part of the piece in which the passage is formed, has an annular recess formed in it to receive the lower end of the burner tube, and has a screw thread, cut in the inner surface of the outer wall of said recess, to receive the screw thread cut upon the outer surface of the lower end of the burner tube. In the opposite sides of the lower part of the burner tube, are formed holes to admit air into the chamber, to mingle with the gas as it passes to the burner tip, said holes being made of such a size as to allow the proper amount of air to mingle with the gas. Upon the upper end of the burner tube, is screwed the tip, through a slit, in the upper end of which the gas escapes to be burned. In the tip, above the upper end of the tube, is placed a cap or partition, made of wire gauze or finely perforated sheet metal, the effect of which is to finely divide the escaping stream of mingled gas and air, and cause it to escape thoroughly mingled and uniformly from the tip, thus giving a steady flame. An open ring tube, the open ends of which enter the opposite sides of the upper part of the tube, is cast solid with the burner tube, and is bent a little to one side so as to pass over the tip parallel with and a little in the rear of the slit in the top of the tip. By this arrangement the mingled air and gas will be thoroughly heated before it escapes through the tip, and will thus, it is claimed, be prepared to produce the best effect.

HORSE POWER.—David S. and Josiah D. Heebner, Norritonville, Pa.—This invention relates to links for endless chains for horse power, and it consists in making such links higher at one end than at the other, in order that, while the lower edges of the links stand at an inclination above the rollers, the upper edges may be horizontal, and so afford level footholds for horses.

WAGON BOLSTER AND STAKE.—Jacob W. Smith, Dixon, Iowa.—This invention relates to a bolster having adjustable stakes which can be placed as near to or as far from the ends of the bolster as may be desired, and fastened in any position for the purpose of accommodating boxes or sacks of different widths and carrying loads of different magnitudes.

BUCK SAW FRAME.—William Hankin, of Hawley, Pa.—This invention relates to a new means of bracing buck saw frames by L shaped staple braces fitted through the ends of the cross bar, and bearing against the side pieces of the frame. The lower ends of the braces can be carried nearer the saw than any other bracing device, and a better effect is, consequently, produced. The cross bar is at the same time braced above and below, and cannot rack at the shoulders. The entire saw frame, in fact, becomes rigid, and, having the braces in the center, is balanced. The band on the upper part of the frame is unobstructed.

IMPROVED WOODEN PAVEMENT.—A durable and reliable foundation for wooden pavements is an absolute necessity, and at present an item of considerable labor and expense. Mr. Charles K. Deutsch, of New York city, proposes, in an invention just patented by him, to dispense with the use of a separate foundation, or at least make the same of less importance, by making the paving blocks sustain each other. The wooden pavements now in use consist of wooden blocks placed side by side upon a layer of boards, beams, or strips of wood. If at any one point this layer is interrupted, the block or blocks above will be forced down, they being not otherwise sustained. The invention of Mr. Deutsch consists in constructing and connecting the blocks of a wooden pavement to make them interdependent and mutually supporting. Each block has L shaped ends, forming steps and shoulders. The step at one end supports the pendent shoulder at the other end of each block. As the several blocks are put together, the steps will come under the shoulders as shown, whereby one block is made to support the other. In a pavement thus composed all blocks of one row are connected and help to sustain each other. The foundation therefore need not be prepared of wooden layers, as it is claimed a good bed of gravel will be sufficient in most cases. Still, a suitable foundation may be used if desired. The several rows of blocks may be locked together by strips entering grooved sides of the blocks, or by projecting tenons or equivalent means. Cement, gravel, or sand may be filled between the blocks, which completes the structure.

FILTER.—Johann P. A. Vollmar, of Bingen, Germany.—This invention relates to a new filtering apparatus, whereby wine or other liquid can be thoroughly cleared in a short space of time and in a continuous stream. The invention consists in the use of tapering frames, made of sheet metal and surrounded with the filtering fabric in such manner that the liquid passing through the large surfaces of the latter will be collected by the converging braces of the frame and caused to enter the discharge tube. The apparatus is used by putting up sections, as shown, and putting charcoal or other filtering substance around them, filling the funnel therewith to such hight as may be needed for the more or less impure liquid. The liquid is then poured in, and runs off through a suitable spout or pipe. The several upright braces in the filter serve to collect the filtered liquor and guide it to the discharge pipe.

ELEVATORS.—Mr. Patrick Byrne, of Nashville, Tenn., whose improvements in elevators were recently illustrated and described in this journal, has invented still further improvements, in the construction of elevators for warehouses, etc., which he has just patented. A prominent feature of the invention is that the hand rope is so placed that it may be operated from the platform of the elevator. Further improvements are made, which cheapen the cost and simplify the construction.

ATTACHMENT FOR SEWING MACHINE.—The invention of Mr. Abel H. Bartlett, of Spuyten Duyvil, N. Y., relates to improvements in the attachment of various devices for tucking, cording, hemming, and quilting. It consists in the use of a base plate, with arms or plates supported one above another along the front of the base plate, the base plate being provided with a cloth pressing spring, which controls the cloth in passing from the said devices to the needle. The invention further comprises various adjuncts for use in connection with the plates in performing the above named operations. They are of such a nature that no definite idea of their functions can be given in the present notice. The same inventor has patented a device for folding, binding, and hemming, the binding being formed out of the cloth that is bound. These improvements are of a thoroughly practical character, and are neat, compact, and tasteful in design, while convenient to apply.

BREAD CUTTER.—Isaac S. Bunnell, Carbondale, Pa.—This invention relates to a new machine for cutting bread; and consists in a new manner of hanging the knife so that it will be supported at both ends and moved with a slight drawing motion to insure a powerful cut. The knife is pivoted at one end to a straight lever, and at the other end to an elbow lever, so that, when swung down by a person holding it by the handle, it will descend at the handle end slightly faster than at the other end, thus producing a drawing cut. The device is adapted to cutting hay, straw, etc., without change in the arrangement of its working parts.

MEDICAL COMPOUND FOR CURE OF CONSUMPTION.—James E. Larkin, Newark, N. J.—This invention and discovery relates to a medical composition designed for the prevention and cure of consumption; and it consists in a liquid compound, composed of various ingredients in certain proportions, compounded in a particular manner, which, it is claimed, acts directly upon the lungs and bronchial tubes, in a very effective manner, when these parts are affected with incipient disease.

CAKE MIXER.—This is a simple device, operated by a crank, for mixing sponge cake. From the shaft of the crank extend radial arms; at each end, near the bearings, these arms are connected by rods. This arrangement turns in a box or case, the whole resembling the old style of churn with rotary dasher. The materials for the cake are put in at the top, which is provided with a suitable cover. This is the invention of Thomas Holmes, of Williamsburgh, N. Y.

WASHING MACHINE.—William Martin, Orford, Iowa.—A long rectangular tub or case is made considerably deeper at one end than at the other, in which a rack or rubber is pivoted at its upper end, near one end of said case, in front of springs, and provided with a concave face, against which the clothes are rubbed. The springs are designed to allow the rubber or rack to yield back or move to some extent while the clothes are pressed against them, and then move forward again, with the clothes, about the same amount, before the pressure is taken off. The said springs are specially designed to yield easily during the first part of the backward movement, and to offer much greater resistance during the last part, being shaped so that at first the resistance to the rubber is near the front, where it is attached to the case, and during the latter part it is in the front part, much nearer the end bearing against the rubber. The rubber, to be worked forward and backward for actuating the clothes, has a convex corrugated face, and is pivoted to arms, and has a long crotched arm extending round and jointed to a crotched or braced bar pivoted to the end of the case, also jointed together by a link, to a sweep which, being oscillated vertically, imparts a swinging motion to the rubber or beater, which also oscillates it at the same time. This oscillation is intended to impart a slow turning motion to the mass of clothes between the rubber at the same time they are beat up.

MILK CAN.—Thomas M. Bell, New York city.—This invention consists in a new method of cutting out the pieces of which a milk can is formed, in order to economize the material and lessen the cost thereof, and of connecting base and bottom. There is nothing new in the construction of the breast, neck, and cover of the can. Around the outer side of the upper edge of the base or bottom band is formed a rabbet to receive the turned down edge of the bottom and the lower edge of the body. The edge of the bottom is turned upward so as to lie closely along the upper part of the inner surface of the bottom band, and is then turned over the upper edge of said band. This construction of the bottom leaves no seam or joint at the base of the can for the milk to lodge in and sour, and thus enables the can to be more easily kept clean and sweet. The bottom hoop is made solid in one piece, and is struck up into the form of a flange around the edge of a flat disk of sheet metal. The flat central part is then cut out, leaving the hoop of exactly the right size to fit around the bottom of the can, where it may be secured in place in the ordinary manner. The cut out central part of the disk is then used to form the neck of the can, so that there is no waste of metal. The breast hoop is formed solid in one piece by striking up the outer part or edge of a disk of sheet metal into the desired form. The central flat part is then cut out, leaving the hoop in proper form to fit upon and overlap the upper part of the body and the lower part of the breast. The central cut out part of the disk is used for forming the cover so that there is no waste of metal. By this construction the various parts of the can, being formed by dies, will exactly fit their proper places, thus saving a great amount of time and labor in putting the can together.

AUTOMATIC RAILROAD SIGNALS.—Henry S. Evans, West Chester, Pa.—This invention has for its object to furnish an improved apparatus for operating railroad signals by the passing engine or train. Two signal posts are erected at a suitable distance from the track, and at least at such a distance apart that the entire train shall pass one of said posts before its forward end reaches the other post. The posts are placed upon the right hand side of the track, a separate set being used for each track upon a double track road, and for each side of the track upon a single track road. To the upper ends of the posts are pivoted pulleys, with which pulleys are rigidly connected the signals. One signal is a single straight signal or wing, and the other is a double signal, its parts or wings being at right angles with each other, and is designed to be used where there is a crossing. An endless chain or wire, or a combination of chains and wires, passes around the pulleys, and is so connected as not to slip upon them, so that the two signals may always be moved together. To the pulleys are also attached the upper ends of chains, the lower ends of which are attached to the outer ends of levers, which are pivoted at their inner ends to suitable supports beneath the track. Two other levers, extending in opposite directions along the right hand rail of the track, have their outer ends pivoted to suitable supports at the side of the rail. The inner or adjacent ends of these levers are connected to the first set of levers in such a way that a train, in passing, will operate the signals gradually.

BACK BAND HOOK.—Henry Beagle, Jr., Philadelphia, Pa.—This invention has for its object to furnish an improved back band hook which shall be simple in construction and convenient in use, being so constructed as to be easily adjusted upon the back band, and securely held in place when adjusted. The body or plate of the hook has two parallel slits formed in it, dividing it into three parallel bars. The central bar is struck up or pressed outward to project above the planes of the plate. The slits are so formed that the edges of the central bar may be about upon a line with the adjacent or inner edges of the outer bars, so that the back band, when passed through the spaces between the edges of the three bars, may be bent sharply, and may thus be held securely by friction. The hook over which the trace, tug, or chain is passed to be held, is cut out of the solid body of the part of the plate projecting downward from the lower edge of the lower bar of the said plate, and is bent, struck up, or formed into proper shape to receive the trace, and, at the same time, into such a shape that its point may be about in the plane of the plate or body of the hook, so that the said point cannot catch upon the harness of the other horse or upon the reins, and so that the trace cannot become accidentally unhooked. The metal around this hook is cut away, so that the trace can be conveniently slipped over the point of the said hook.

CUTTING APPARATUS FOR HARVESTER.—James T. Polson, Laclede, Mo.—This invention relates to reapers, more particularly to the cutters of reapers; and consists in the peculiar arrangement of a hinged plate by which the said cutters, which are of the rotary kind, may be readily removed. The upper plate of the finger bar is hinged to the upper portions of the guards so that it can be readily swung up to expose the cutters under it, while it is held down by screws when the device is in operation, washers being put around the screws to hold the plates sufficiently far apart. The cutters are fitted upon upright gudgeons, which have their bearings in the lower plates of the finger bar, and are to be revolved when in action. The cutters are of suitable form, having either projecting arms or polygonal cutting edges, or other shape. Between the plates is mounted, upon each gudgeon, a toothed wheel. The several wheels are either connected with each other by intermediate gear wheels, and finally also with a toothed wheel on the driving shaft, so that all cutters will simultaneously and with equal velocity be revolved in the same direction, or the wheels may have beveled teeth and mesh into pinions on a driving shaft which hangs under the finger bar.

PICTURE NAILS.—Thomas C. Richards, New York city.—The object of this invention is to provide the public with a new and improved article of manufacture in the line of picture nails. It consists in the construction and arrangement of the porcelain scalp or head, a nut secured thereto by lead or its equivalent run into a cavity of said head, and having a central screw threaded perforation to receive the head of the spike.

WRENCH.—John Gates, Portland, Oregon.—This invention has for its object to improve the construction of monkey wrenches in their several details, so as to make the same stronger and more reliable without a greater outlay of labor or material than the devices of similar kind now in use. The main bar or shank of the wrench is fitted into the handle, and holds the upper jaw. The screw head fits partly into a notch or recess cut into the main bar, the lower end of the screw resting on an ear of the ferrule. The notch gives full support to the screw head, and holds the same clear of the ferrule. The liability of the wrench becoming loose between the screw head and ferrule is thus obviated.

HOT AIR FURNACE.—Joseph C. Barnes, Albany, N. Y.—This invention relates to improvements in heaters or hot air furnaces. It consists in an annular cold air space surrounding the ash pit, fire pot, and combustion chamber, which is surrounded by another annular space into which the product of combustion is discharged between tubes connecting an upper and a lower section of the cold air space. The whole is surrounded by an outer case, and comprises an arrangement calculated to be very effective in economizing the heat.

GATE.—Samuel Smyth, East Bridgewater, Pa.—This invention consists in hanging gates on horizontal projecting trunnions, and applying sliding weights to the upper ends of the supporting bars or posts which balance the lower part of the gate, but overbalance it when the same is turned up. A very simple and convenient gate is thereby produced, for fences at road crossings, etc.

TOOL HANDLE FASTENER.—James G. Wilbur and Hiram H. Hurlbut, of Kilbourne City, Wis.—This invention relates to a new and useful improvement in fastening the handles in axes, hammers, and all similar tools or implements; and consists in the employment of a metallic key with its side or one or more of its angles ragged or bearded. The key is fitted to the back portion of the eye, and is of a sufficient width to fill the wedge shaped space left between the handle and the back of the eye. The key is made of iron or any other suitable metal, and its flat side, which comes in contact with the handle, is made ragged or bearded by starting up portions of the metal with a sharp punch or cold chisel. The beards or teeth penetrate the wood of the handle, or create so much friction that the handle cannot be withdrawn unless the key is driven out. This is easily done with a hammer or hammer and punch. The advantages claimed are that the ax, hammer, or other tool or implement, to which the improved key is applied, is securely fastened to the handle by the bearded key, so that there is no danger of its flying off when in use. The handle may be removed without injuring it, if the tool fails, and without injuring the tool if the handle fails, as, by the present mode of fastening, the handle has to be burned out of the ax, which of course destroys the handle, and frequently destroys the temper of the ax.

MECHANICAL MOVEMENT.—William Weaver, of Greenwich, N. Y.—This invention has for its object to furnish an improved mechanical movement for driving scroll sawing machines and other light machinery by hand or other power, where great velocity is required; and it consists in the arrangement of belts, two or more, with pulleys and a driving shaft, with two posts, to and between which the pulleys are pivoted. The driving pulley or drum, is made so as to receive all the belts, and to one of its journals is attached a crank or pulley, by which the power is applied. Belts pass around the driving pulley or drum and around loose pulleys, each belt having its own loose pulley. The opposite sides of the belts are drawn inward and pressed around a shaft, placed between the drum and loose pulleys, from which shaft the power is taken to the machinery to be driven, so that the said belts may pass around the opposite sides of said shaft alternately, making the strain upon it equal in opposite directions, thus relieving it from any side strain from said belts. The loose pulleys are made self tightening.

PIPE ELBOW.—Isaac Leas and William H. France, Terre Haute, Ind.—This invention relates to improvements in the manufacture of stove pipe elbows; and it consists in making them of one sheet of metal by cutting out say about four triangular pieces from each side, extending not quite to the center, at suitable distances apart; then rolling or bending the sheet to cut perpendicular into the form of a tube; then bending it so that the sections between the horizontal notches come together and lap; and finally riveting the ends and lapped edges of such sections.

GROUND MARKERS AND FURROWERS.—George W. Martin, William G. Parrish, and James A. Petrie, Elizabeth, N. J.—The object of this invention is to furnish to farmers a simple and convenient implement for marking and furrowing land for planting corn, potatoes, and other seeds, by which the ground may be furrowed in each direction, the intersections of the furrows being at the proper distance from each other for the rows. Different seeds require planting at different distances apart, as well as at different depths in the ground. The plows of this machine being adjustable as to both depth and distance apart, the machine is claimed to be admirably adapted for the purposes intended, and is a most valuable labor saving farm implement.

SHOEMAKERS' JACK.—Franz Weissenborn, Egg Harbor City, N. J.—The post for supporting the last is fitted into the jack in such manner that it may be swung more or less outward or inward, a spring, which is concealed within the jack, holding it inward—that is, vertical to the face of the jack. The rest for supporting the toe of the last is provided with a slotted plate projecting toward the post and fastened to the jack by a bolt that penetrates said plate. The rest is thus adjustable on the jack to admit of longer or shorter lasts. The shoemaker can turn the last to the right or left without taking the hands from the work. The last can be conveniently turned in either direction to bring the boot or shoe in the most convenient position for handling.

WAGON BRAKE.—Henry Sager, Penn Station, Pa.—This brake is a simple block of wood, or other material suitable for the purpose, fitted between the wheels, and so connected with a brake lever by a rod and bell crank that it may be pressed onto or against the wheels with any required force by the driver to retard or stop the motion of the wagon by the friction thus produced. The brakes may be operated simultaneously; or a car or wagon may have but a single brake, should one be sufficient, as it might be when there were no heavy grades. The double brake may be applied below the center or middle of the wheels, and by upward pressure, if desired. A slight movement of the brake lever applies or releases the brake to or from the wheels. Accidents are almost daily occurring in coal mines, resulting in injuries to man or beast, or to the wagons, for the want of some efficient means for controlling the motion of the wagons or cars. By this improvement, it is claimed that the momentum may be checked almost instantly, and the wagon or car controlled by the driver in the easiest and most perfect manner.

COTTON PRESS.—Samuel S. Rembert, Memphis, Tenn.—In this invention, a very unique method of applying the power is employed. There are two followers, upon opposite sides of the bale, both of which receive compression equally, and of a gradually increasing force, as the bale becomes compressed. The speed of the followers diminishes as the power increases. This is accomplished by means of a screw, and a combination of toggle jointed levers placed on one side of the bale, the power being transmitted to the follower on the other side by means of connecting rods and a cross head. The whole arrangement is simple, compact, and evidently powerful.

BREECH LOADING FIRE ARM.—Invented by John D. Wilkinson, Plattsburgh, N. Y.—In general terms, this invention may be said to consist of a revolving disk at the breech of the barrel, on a spindle arranged under the barrel, to revolve and also to slide backward and forward, and extending a suitable distance behind the disk, for being actuated by the hand used for pulling the trigger and cocking the hammer, to revolve the disk for opening and closing the breech and discharging the shell. The simplicity and cheapness of the arrangement are prominent features of the invention, and it is claimed that the gun may be manipulated and fired with great rapidity without taking it from the shoulder. After the trigger is pulled, the hammer may be raised and the spindle turned without moving the hand away, and when the cartridge is applied, the spindle and disk may be turned back by the thumb, as the hand is placed in position for firing.

CORN HUSKER.—This is the invention of Daniel Sager, of New York city, assignor to James A. Robinson, of Brooklyn, N. Y. The ears are stripped from the stalk by revolving pickers, and, rolling down a shaker, meet a blast from a fan blower, which cleans them from dust and dirt, then pass between an endless apron, of peculiar construction, and rollers, whereby the husks are removed and the ear is discharged.

PUMP.—John Roberts, Madison, Ohio.—This is a new method of securing valves in pumps, this valve plate being confined below small knobs on the inside of the cylinder, the plate being held by the friction against the cylinder, and the friction being produced by the expansive force of a spring.

WATER METER.—The invention of Daniel L. Tower, New York city, consists of a shell containing an oscillating valve plate, from which rises a flange which makes a water tight joint with the shell. This flange with the valve is made to work first in one direction and then in another, operating valves which direct the flow alternately upon the two sides of the flange, the motion being communicated by a crank arm to a suitable registering apparatus.

GAUNTLET GLOVES.—Virgil Price, New York city.—The object of this invention is to so arrange detachable gloves and gauntlets that, when worn, they cannot come apart at the wrists, but will be properly held together, to appear as though united. The invention consists chiefly in forming a projecting bead at the upper end of the glove, and a corresponding bead on the lower end of the gauntlet, so that thereby the glove will be prevented from slipping down out of the gauntlet.

BLIND SLAT OPERATOR.—Henry B. Lum, Sandusky, Ohio.—This is a new and improved blind slat operator, which consists in an oscillating cranked rod passing through the window frame and connecting with an arm or crank on one of the slats in such manner that it will not interfere with the opening and closing of the blinds, and will operate the slats in whatever position the blinds may be, whether open or closed, or partly open.

APPLICATIONS FOR EXTENSION OF PATENTS.

ICE CREAM FREEZER.—H. B. Masser, Sunbury, Pa., has petitioned for an extension of the above patent. Day of hearing, January 3, 1872.

CUSHIONS FOR BILLIARD TABLES.—Hugh W. Collender, New York city, has petitioned for an extension of the above patent. Day of hearing, December 27, 1871.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING OCTOBER 17, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
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On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

119,911.—DAMPER.—J. Ash, Sterling, Ill.
119,912.—FRUIT CAN TONGS.—A. T. Atherton, Lowell, Mass.
119,913.—CAR BRAKE.—J. T. Bassett, Galesburg, Ill.
119,914.—HARNESS TRIMMING.—J. Bauer, Newark, N. J.
119,915.—PAPER BAG.—B. S. Binney, Somerville, Mass.
119,916.—SCREWS.—J. M. Carpenter, Pawtucket, R. I.
119,917.—PAPER FILE.—C. Chapman, Chicago, Ill.
119,918.—SCISSORS.—E. Clapp, Boston, Mass.
119,919.—HYDRAULIC MAIN.—C. Collier, Selma, Ala.
119,920.—LANTERN.—M. B. Dyott, Philadelphia, Pa.
119,921.—HEMMER.—H. A. Ellis, Greenbush, N.Y.
119,922.—TRACTION WHEEL.—G. W. Fitts, Oberlin, Ohio.
119,923.—CANAL BOAT.—P. H. Fontaine, Reidsville, N. C.
119,924.—GUN CARRIAGE.—J. G. Foster, Boston, Mass.
119,925.—SPIKE MACHINE.—M. Foster, Cleveland, Ohio.
119,926.—BREAD BOARD, ETC.—B. Fulton, Pulaski, Iowa.
119,927.—TOY.—H. N. Gallagher, Worcester, Mass.
119,928.—SPARK ARRESTER.—B. Garvin, Oshkosh, Wis.
119,929.—EVAPORATOR.—W. F. Gibson, Ryegate, Vt.
119,930.—SEWING MACHINE.—E. L. Howard, Hingham, Mass.
119,931.—FIRE EXTINGUISHER.—E. Jones, Pierrepont, N. Y.
119,932.—BRAKE.—H. B. Lee, Maryville, Mo.
119,933.—WASH BOILER.—E. F. Lewis, Winsted Lake, Minn.
119,934.—COTTON PRESS.—L. Lewis, Vicksburg, Miss.
119,935.—PENCIL CASE.—W. A. Ludden, Flushing, N.Y.
119,936.—FIRE EXTINGUISHER.—J. H. Manning, Chicago, Ill.
119,937.—HARVESTER.L.J.McCormick,W.R.Baker,Chicago,Ill.
119,938.—CLOTHES PIN.—H. Mellish, Walpole, N. H.
119,939.—FIRE ARM.—G. Merrill, East Orange, N. J.
119,940.—FIRE ARM.—G. Merrill, East Orange, N. J.
119,941.—TOBACCO PIPE.—J. M. Mur, New York city.
119,942.—CONDENSER.—J. R. Neil, Brooklyn, N. Y.
119,943.—RECTIFIER.—J. R. Neil, Brooklyn, N. Y.
119,944.—HINGE.—A. A. Oat, Philadelphia, Pa.
119,945.—BLIND HINGE HOOK.—G. Orr, Needham, Mass.
119,946.—CONFECTIONS, ETC.—S. A. Parker, Cambridge, Mass.
119,947.—FILE.—I. N. Patten, Memphis, Tenn.
119,948.—LOCK.—G. H. Peacock, Webster, N. Y.
119,949.—STOVE.—J. S. Perry, A. Dickey, Albany, N.Y.
119,950.—CORN PLANTER. F.A.Ramey,R.Cross,Woodstock,Va.
119,951.—BUGGY TOP.—J. F. Regan, Chicago, Ill.
119,952.—COVER.—D. Smith, Gilsum, E. Smith, Keene, N. H.
119,953.—DISH WASHER.—W. L. Thompson, Stanstead, Can.
119,954.—HORSE POWER.—J. Valentine, Buffalo, N. Y.
119,955.—FURNACE.—J. G. Weldon, Pittsburgh, Pa.
119,956.—SULKY.—J. Winecoff, Berlin, Pa.
119,957.—TENT.—I. F. Woodward, McMinnville, Tenn.
119,958.—FULLING CLOTH, ETC.—S. Arnold, Philmont, N. Y.
119,959.—COFFEE ROASTER.—J. B. Ashcroft, Brooklyn, N. Y
119,960.—HAIR CURLER.—C. H. Barney, Providence, R. I.
119,961.—BOILER, ETC.—J. P. Bradford, Calamus, Iowa.
119,962.—SEWING MACHINE.—D. W. C. Breed, Medina, N. Y
119,963.—PARING KNIFE.—H. P. Brooks, Waterbury, Conn.
119,964.—PAINT.—R. M. Caffall and D. Miller Alton, Eng.
119,965.—WASHING MACHINE.—A. H. Calkins, Lineville, Ind
119,966.—PIGMENTS.—E. R. Campbell, New York city.
119,967.—BACK SAW.—W. Clemson, Middletown, N. Y.
119,968.—MARBLE SAW.—L. B. Clogston, West Rutland, Vt.
119,969.—TRAVELER.—D. N. B. Coffin, Jr., Boston, Mass.
119,970.—HAT BODY.J.Crisp,Bloomfield,V.V.Dodd,Orange,N.J
119,971.—WINDMILL. M.Crossman,P.A.Spicer,Marshall,Mich.
119,972.—WINDMILL. M.Crossman,P.A.Spicer,Marshall,Mich.
119,973.—WHEELBARROW,ETC.—B.G.Fitzhugh,Frederick,Md.
119,974.—BROILER.—B. G. Fitzhugh, Frederick, Md.
119,975.—WINDOW SHADE, ETC. B.G.Fitzhugh,Frederick,Md.
119,976.—DUMPING CART.—B. G. Fitzhugh, Frederick, Md.
119,977.—FURNACE.—B. G. Fitzhugh, Frederick, Md.
119,978.—SLUICE, ETC.—C. J. Garland, Gwin Mine, Cal.
119,979.—EYELET.—T. Garrick, Providence, R. I.
119,980.—CHURN DASHER.—D. L. Grover, Groton, N.Y.
119,981.—PULLEY BLOCK.—C. Hall, New York city.
119,982.—VENTILATOR.—G. A. Hines, Brattleborough, Vt.
119,983.—CURTAIN FIXTURE.—F. Hobart, Mt. Pleasant, Iowa
119,984.—BOAT HOIST, ETC.—J. Humphries, Washington, D.C.
119,985.—CULINARY SHELF.—G. T. Hunsaker, Carthage, Ill.
119,986.—HOE.—T. V. Kimble, Indianapolis, Ind.

119,987.—LIGHTNING ROD.—G. S. Knapp, Winona, Minn.
119,988.—HOISTING MACHINE.—G.R.Long, S.King, Lanark, Ill.
119,989.—REAMING TOOL.—J. B. Miller, Pittsburgh, Pa.
119,990.—CLOCK CASE.—C. A. Moore, Westbrook, Conn.
119,991.—BEE HIVE.—E. O'Connor, Philadelphia, Pa.
119,992.—EXCAVATOR.—R. R. and R. R. Osgood, Troy, N.Y.
119,993.—SUSPENDER, ETC.—T.O.Potter, J.W.Smith, Bost'n, Ms.
119,994.—PHOSPHATES.—D. W. Prescott, Edinburgh, Va.
119,995.—CARD RACK.—L. C. Prindle, Chicago, Ill.
119,996.—WATER ELEVATOR.—S. G. Randall, Providence, R.I.
119,997.—FIRE ESCAPE.—T. C. Rice, Worcester, Mass.
119,998.—SAW.—D. W. Riker, San Francisco, Cal.
119,999.—STOVE.—G. Roberts, Montreal, Canada.
120,000.—TELEGRAPH.—J. Rowe, Paterson, N. J.
120,001.—THILL.—C. W. Saladee, St. Catharine's, Can.
120,002.—THILL.—C. W. Saladee, St. Catharine's, Can.
120,003.—PACKING.—A. J. Simmons, Indianapolis, Ind.
120,004.—CARRIAGE NUT.—J. P. Skinner, Plantsville, Conn.
120,005.—FURNACE.—J. Y. Smith, Pittsburgh, Pa.
120,006.—FURNACE.—J. Y. Smith, Pittsburgh, Pa.
120,007.—FURNACE.—J. Y. Smith, Pittsburgh, Pa.
120,008.—FURNACE.—J. Y. Smith, Pittsburgh, Pa.
120,009.—WOOD PRESERVING.—R. Sutphen, Freehold, N. J.
120,010.—SASH TIGHTENER.—W.E. Swett, San Francisco, Cal.
120,011.—SAD IRON HANDLE.—A. Tait, Sonora, Cal.
120,012.—SMUT MILL, ETC.—B. T. Trimmer, Rochester, N. Y.
120,013.—RAILWAY CAR.—J. G. Wetmore, Winsted, Conn.
120,014.—CONCENTRATING ORE.—T. Wren, Hamilton, Nev.
120,015.—LATHE CHUCK.—C. E. Albro, Fulton, N. Y.
120,016.—PAVEMENT.—C. Allen, Albany, N. Y.
120,017.—HAMMER.—I. Althouse, Columbus, O.
120,018.—HORSE POWER.—S. S. Ammons, Winona, Miss.
120,019.—TELEGRAPH.—G. L. Anders, Boston, Mass.
120,020.—INSECT TRAP.—J. J. Armstrong, King's Co., N. Y.
120,021.—COFFIN.—S. Avery, Phœnix, N. Y.
120,022.—WHEEL.—A. Ball, Canton, O.
120,023.—CUTTING WHEEL.—H. Belfield, Philadelphia, Pa.
120,024.—STOVE PIPE.—E. E. Blinn, Brewerton, N. Y.
120,025.—WAGON BODY.—M. C. Boyer, Norristown, Pa.
120,026.—SHORTENING.—H. W. Bradley, Plainfield, N. J.
120,027.—HARVESTER.—H. H. Bridenthall, Jr., New Derry, Pa.
120,028.—CULTIVATOR.—J. T. Brittain, Springfield, Ohio.
120,029.—FIRE ALARM.—H. L. Brower, New York city.
120,030.—IRONING BOARD.—B. D. Brown, D. Moyer, Phila., Pa.
120,031.—CHIMNEY.—C. H. Brown, Atlantic, Iowa.
120,032.—HINGE.—I. Buckman, Jr., Williamsburgh, N. Y.
120,033.—VALVE.—H. L. Butler, Pittsburgh, Pa.
120,034.—GALVANIC BATTERY.—J.A. Callaud, Nantes, France.
120,035.—WAGON SEAT.—E. Caswell, Lyons, N. Y.
120,036.—ROCK DRILL.—J. Chapman, Amsterdam, N. Y.
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REISSUES.

4,592.—TREATING VEGETABLE AND ANIMAL SUBSTANCES.—C. Alden, Newburg, N. Y.—Patent No. 100,385, dated March 15, 1870; reissue No. 4,011, dated June 7, 1870; reissue No. 4,287, dated March 7, 1871.
4,593.—LUBRICATOR.—J. Broughton, New York city.—Patent No. 45,694, dated January 3, 1865.
4,594.—AXLE BOX.—D. Dalzell, South Egremont, Mass.—Patent No. 106,469, dated August 16, 1870.
4,595.—STOVE.—J. M. French, Rochester, N. Y.—Patent No. 40,663, dated November 17, 1863; reissue No. 4,004, dated May 31, 1870.
4,596.—LOCK.—L. F. Munger, Rochester, N. Y.—Patent No. 17,804, dated July 14, 1857; reissue No. 62, dated April 2, 1861; extended seven years.
4,597.—COLTER.—W. W. Stillman, Mount Hawley, Ill.—Patent No. 57,007, dated August 7, 1866.
4,598.—Division A.—PAINT.—J. G. Tarr, A. H. Wonson, Gloucester, Mass.—Patent No. 40,515, dated November 3, 1863; reissue No. 2,722, dated August 6, 1867.
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4,601.—LANTERN.—W. Westlake, J. F. Dane, J. P. Covert, Chicago, Ill.—Patent No. 48,898, dated July 18, 1865; reissue No. 2,387, dated August 14, 1866.
4,603.—LUBRICATOR.—J. B. Wickersham, Philadelphia, Pa.—Patent No. 82,667, dated September 29, 1868.
4,603.—ICE MACHINE.—F. Windhausen, Brunswick, Germany.—Patent No. 101,198, dated March 22, 1870.

DESIGNS.

5,314.—COFFIN TOP.—W. G. Algeo, Rochester, Pa.
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